LIGHT, JULY 21, 1938 FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (50 lines).

8-10, CORPORATION ST., COVENTRY. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.

GUILDHALL BUILDINGS, NAVIGATION ST., BIRMINGHAM, 2. Telegrams: Autopress, Birmingham. Telephone: Midland 2971.

260, DEANSGATE, MANCHESTER, 3. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.

26B, RENFIELD ST., GLASGOW, C.2. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

SUBSCRIPTION RATES: Home and Canada. Year, £1 13 0. 6 months, 16s. 6d. 3 months, 8s. 6d.
Other Countries: Year, £1 16 0. 6 months, 18s. 0d. 3 months, 9s. 0d.

No. 1543. Vol. XXXIII. JULY 21, 1938. Thursdays, Price 6d.

The Outlook

"1,000 Off"

PERHAPS it was inevitable that large sections of the daily Press should, deliberately or otherwise, misinterpret the statement made last Friday by Sir Kingsley Wood, the new Air Minister, when he cut the first turf on the site for the new factory which Lord Nuffield is to build adjoining the Castle Bromwich aerodrome. The great national newspapers have taken the sane view of the announcement and have explained to their readers that it must of necessity be some considerable time before the Nuffield factory can begin to deliver Spitfires.

It is, of course, quite obvious that even Lord Nuffield's tremendous resources cannot perform miracles. Apart from putting up the new factory, which probably will not take very long, there is the question of obtaining the necessary equipment. Machine tools are in great demand at the moment, and even if, as seems likely, Lord Nuffield's own engineers should design and produce some of these tools, there is the problem of materials. Taking into consideration these factors, it would appear to be a reasonable assumption that the first Spitfield (or Nuffire?) will not be flying until early in 1940.

Sir Kingsley Wood's remark that Lord Nuffield will be given a free hand in the methods he adopts for building the Spitfire has been interpreted by many newspapers to mean that "he will be free of Air Ministry red tape." That, of course, will not be so. The materials used will have to conform to D.T.D. specifications, and there will have to be A.I.D. inspection to see that materials and workmanship are up to standard. To do otherwise would, apart from other considerations, be to impose a gross unfairness on the rest of the aircraft industry, which has to comply with all the Air Ministry requirements.

What Sir Kingsley Wood meant obviously was that Lord Nuffield's production engineers will be given all the drawings and probably a complete machine and all its component bits and pieces, and that they can then please themselves how they set about tooling-up and jigging for the manufacture and assembly. That, of course, is a very different thing from being "free of Air Ministry red tape." What it amounts to is that the Nuffield factory will be able to please itself whether it produces a certain piece of structure by pressing, stamping, drop hammer or what-not.

Design for Production

WHEN it was first announced that Lord Nuffield was to be asked to establish an aircraft factory, *Flight* expressed the opinion that this might be a good opportunity for going into quantity production with a type of aircraft initially designed with rapid manufacture in view. We pointed out that neither the engine nor the aircraft first selected for construction in shadow factories had been created with that object, their design having been completed before the question of large-scale production arose. We explained that the decision taken was inevitable, as there was no time for waiting until an engine and an aeroplane could be specially designed, and that in the circumstances the decision was probably a natural and, on the whole, wise one.

The prototype of the Spitfire was first flown in public at a demonstration organised by the Vickers and Supermarine companies at the Southampton aerodrome in June, 1936, when production on the present scale was not contemplated. Thus it appears that history is about to repeat itself, with this important exception that by the time the new Nuffield factory can be expected to be producing Spitfires in quantities, there will be available the accumulated experience of several fighter squadrons, so that it should be possible to judge whether certain minor modifications, desirable in the interests of production, could or could not be incorporated without affecting the performance and general handling of the machine. It is conceivable that the Nuffield production engineers might suggest such changes, and that these would speed-up the manufacture.

It is reported that lately the Germans have been looking into the question of performance versus man-hours. If one machine is only a few miles an hour slower than another, but takes considerably fewer man-hours to produce, the slower machine is the one to be ordered. The actual speed of the Spitfire may not be disclosed, but it has been stated to be of the 350 m.p.h. variety. Thus there is reason to believe that, even if the Nuffield-produced Spitfires do not come along until 1940, the machine should still be far from obsolete. This view is confirmed by the fact that one of these machines is now being prepared for an attempt on the world's landplane speed record.

Fleet Air Arm Maintenance

THE Admiralty is setting about the business of organising the Air Branch of the Navy in a very thorough manner. On the Service page of this issue arrangements are set forth for providing for the maintenance of aircraft and engines in the Navy. New branches are introduced, air artificer for example, which will correspond to engine room artificer, electrical artificer, and ordnance artificer. Air fitters and air riggers form a second branch, while the third branch revives the familiar term air mechanic, the "ek emma" of the old R.F.C. days.

Of course, any business or Government department can in time acquire experts, but they cannot be conjured out of nothing by the waving of a wand. The air branch of the Navy will for some time to come need ample help from the R.A.F. For the present the air artificers and the air fitters and air riggers will have to be trained at R.A.F. schools, though the Admiralty announces its intention of setting up a school for apprentices, evidently on the lines of Halton. For the present the Air Ministry has agreed to permit the transfer of a certain number of airmen to the air branch of the Navy, which, considering the enormous recruiting campaign which the Air Ministry is now undertaking, is quite a public-spirited action. Evidently the Air Ministry has very loyally accepted the decision of the Cabinet about the transference of the Fleet Air Arm, distasteful as that decision was to the Air Ministry.

It is to be hoped, however, that there will not be much more delay in announcing which stations are to be transferred from the Air Ministry to the Admiralty. The long delay in making this announcement suggests a lack of unanimity.

Tool-room Problem

IF the Air Ministry desires that any given new type of aircraft should be ready for delivery in one year from the date of "I.T.P." (instructions to proceed) being received, it is fairly obvious that, assuming the necessary materials and equipment to be available, the major portion of the tools, pressings, jigs, and so forth, must be completed within six months of the I.T.P.

In the case of a medium-size modern type of stressed-skin aeroplane, some 500,000 man hours, probably, are required to make the necessary tools and jigs for production. To make the whole of this equipment in the firm's own works in six months would mean a tool-room staff of some 400 hands. Assuming that the particular aeroplane remained in production some three to four years, after the first six months only about a fifth of the number of tool-room hands would be needed, chiefly to deal with tool maintenance and replacement. The other four-fifths would have to be discharged and a certain amount of plant be left idle.

In practice, it would be almost impossible to have such fluctuating employment of highly skilled labour, especially outside the main engineering labour districts. It is so economically unsound that no firm in the aircraft industry attempts it.

Present Procedure

WHAT is actually done is that the tooling-up of a new type is spread over a much longer period than six months, so that the tool-room staff is kept constantly employed, while tool manufacture is also sub-contracted to smaller outside firms.

This method is not altogether satisfactory, and the majority of firms take from one to two years to complete the tooling-up of a new type, with, of course, a corresponding delay in the commencement of deliveries. Also, with the present Air Ministry method of ordering complete aircraft of a given type from more than one manufacturer, an unnecessary duplication of press tools occurs, with a corresponding waste of specialised labour.

DIARY OF FORTHCOMING EVENTS—PAGE 66.

Practical Suggestion

ONE who is closely in touch with current production problems suggests that these difficulties could be overcome by the establishment of a tool shadow factory. It would be divided into three self-contained sections, (*a*) press tools, (*b*) making of pressings, and (*c*) jigs, fixtures and gauges.

If we assume that some six new types of aircraft go into production each year, then this shadow factory would need to employ some 2,000 hands on tools, jigs and gauges in addition to those required in the making of pressings.

If such a scheme were to work efficiently it would be essential for the Air Ministry to space out their I.T.P.s as uniformly as possible over the year, so that the resources of the new shadow factory could be utilised to help first one firm and then the next as required.

The suggestion has attractive features. The equipment could be very comprehensive, and highly paid, skilled specialists could be employed to supervise the designing and manufacture of the best tools for a given purpose and the most economical methods of manufacturing them. A big load would be taken off the shoulders of constructors' production engineers; production would be speeded up; and in cases where a new type was made in a number of different factories, the difficulties of making the various details interchangeable would be minimised.

Team Work

ANY performance which beats the prophecies of Jules Verne always captures the imagination of the public. His scientific forecasts seemed so very wild when they were written, and now, compared with facts, they seem so tamely lacking in imagination. Round the world in four days—it would once have made the title of a book for the fourth form boy, at which his master would have frowned as a waste of time, and now it merely records a fact—even if Howard Hughes' achievement last week was not a "circling" of the globe within the usually understood meaning of that term.

The modern fourth form boy is of a very enquiring turn of mind, and he is probably asking himself what lessons have been taught by the great flight of Hughes and his crew. It has proved that human beings can rise to great endurance; we knew that before. It has proved that aero engines will go on running for very long periods without failure; we knew that before. It has proved that aircraft are better than they were a few years ago; we know that such improvement is continuous.

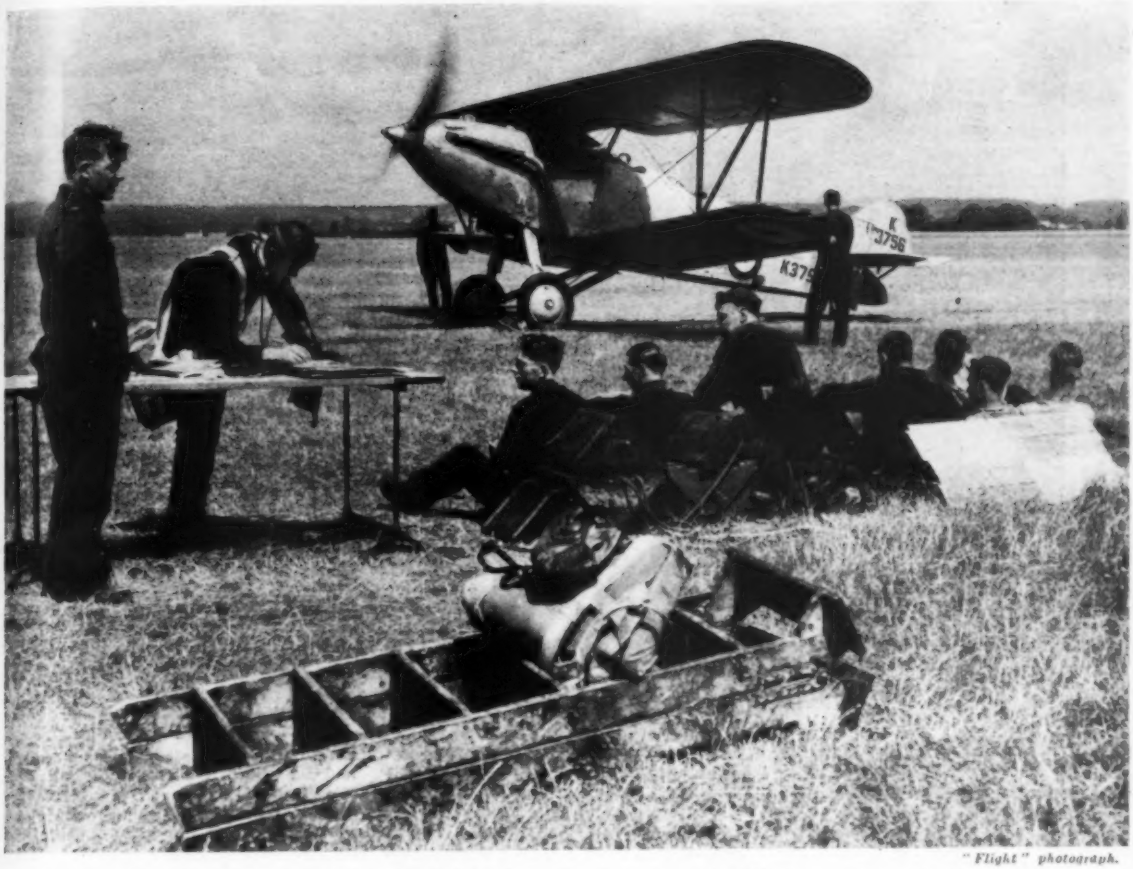
This last consideration is the most significant. With the steady improvement of the machine and the engine, every air record stands to be lowered so soon as a first-class pilot attacks it with a machine better than the machine which set up the record. From that point of view, the flight achieved by Hughes was a thing to be expected, and most probably a lowering of the Hughes record in due course is also to be expected.

The most instructive fact about this flight is that it was team work. The efforts of the solo pilot may have more knight errantry about them, but the future of air transport does not depend on that sort of effort. What a team can do may soon be a regular feature of an airways company's schedule.

Gliding

LAST week's National Gliding Contests—fully reported elsewhere in this issue—have focused attention on the sport of motorless flying. Willy-nilly, its devotees have been dragged before newsreel cameras and microphones. The progress of the competitions has been recorded at some length in most of the papers with a surprising degree of accuracy.

The duration record by Murray and Sproule aroused a good deal of public admiration, but otherwise the popular reaction seems to have been somewhat negative. For this the gliding fraternity may be grateful. Nothing would be worse for the movement than a "popularisation" of the kind which overtook M. Mignet's odd little aeroplane



"Flight" photograph.

IN CAMP. The Oxford University Air Squadron believes in putting in as many individual cross-country flights as possible. In this photograph a member of the squadron is signing for his aircraft before starting off from Ford Aerodrome on a cross-country in a Hart Trainer. A report of the summer camp appears on page 69.

a year or two ago. Fortunately, there is no material in motorless flying for potential makers of Roman holidays (though, doubtless, if the demand were created, there would arise pilots willing to fly sailplanes upside down with their heads in hay-bags).

Gliding is a quiet, rather scientifically precise, specialised sport, and, if we except an occasional farmer in whose cornfield a long-distance pilot has landed, one which causes no annoyance to other people. It can easily be irreparably injured by popularisation. By this we do not mean that it is a snob-sport; it is far kinder to the slender purse than is power flying. The one thing to be feared would be the passing of its control into the hands of other than those admirable people who are running it at present. Any "regimentation" would be unthinkable. For this reason, and not unpatriotically, it is to be hoped that no sort of military enterprise will ever be wished on the movement. In any case, other than by making people accustomed to being in the air, it is questionable if soaring is of colossal value as power-aircraft training except in an *ab initio* sense. The fact that it sometimes works the other way, and that quite a number of Service pilots glide, is no proof to the contrary.

A notable feature of this year's Gliding Contests was the fact that the noteworthy performances were not confined to a handful of experts. Over 90 per cent. of the competitors made good cross-country flights.

Necessary Assistance

DURING the past year or so *Flight* has often referred to the way in which the amount of flying carried out by club members has been steadily decreasing and has made it clear that something would, in due course, have to be done about it if many of the clubs were to keep their heads above water. We have suggested that the reason for this decline cannot solely be explained as the effect of Reserve and Volunteer Reserve free flying opportunities.

Nor can it be explained entirely by the quite considerable cost of post-graduate flying; this cost is probably lower now than it has ever been. An equally important reason is probably that insufficient incentive is given to club members once the initial and subsequent renewal subsidy has been obtained. The recent extension of the subsidy should have helped matters, but the improvement has certainly not been marked and in some cases has been unnoticeable.

Some time ago we learnt that the Air Ministry was considering a plan by which much greater financial assistance could be given to clubs for the use of those members who would offer their services in time of emergency and who were ready to put in a reasonable amount of flying every year. It was not expected that the service offered would be that of ferrying or other flying, but rather that these members would be utilised for some form of ground assistance in which a reasonable knowledge of practical flying would be a distinct asset.

When this suggestion was originally made the whole matter was very much under consideration and not by any means sufficiently certain to make a public announcement either necessary or advisable. Even now it would be premature to suggest any details of the scheme and nothing has yet been decided about the way in which the additional subsidy will be allocated.

However, it is at least good to know that the clubs, which have been doing so much good work during the past thirteen years, are not to be allowed, in some cases, to pass slowly and unhappily out of existence.

"Flight" photograph.

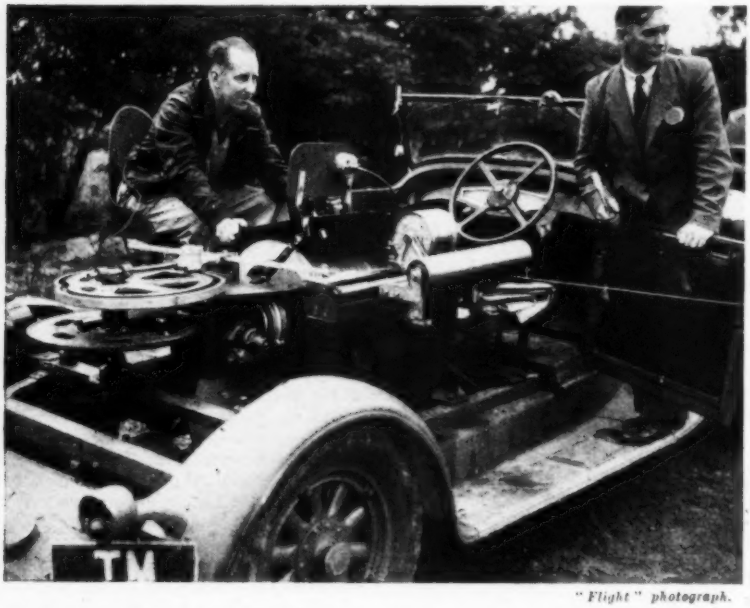
NATIONAL GLIDING CONTESTS

A Fine Week's Sport: Many Cross-country Flights from Dunstable in Spite of Unhelpful Weather

IF the National Gliding Contests, organised by the British Gliding Association and the London Gliding Club, failed to attract the multitude, they at least secured the maximum permissible entry of thirty-odd machines, and (since most sailplanes are owned either by clubs or by "syndicates" of friends) a considerably larger number of pilots. They were likewise responsible for chalking-up some notable cross-country flights and an international duration record.

Those enthusiasts who arrived at Dunstable on the evening of Friday, July 8, learned that Flt. Lt. Murray and Stanley Sproule were going to try for the world's two-seater duration record at 3 a.m. the following morning, so there was just no going to bed.

At 3 a.m. the wind was strong enough, but rather too southerly to make flying easy, but by 4 a.m. it had veered enough and the winch and two-seater sailplane were ready.



"Flight" photograph.

Winding them up: The Grice launching winch in action. The mechanism on the left ensures even winding on the drum. The driver, Mr. Ruffle, has an assistant armed with an axe—the usual precaution against failure of the cable release at the glider end.

At 04.09 hours the pilots released the winch cable and the flight had begun. As we related last week, it finished 22 hours 13½ minutes later in a blaze of head lamps and (*pace* Mr. Hore-Belisha!) amid a concerted roar of car hooters.

The whole of the Saturday was considered a practice day for the competitions. The pilots of other clubs had to get used to the Dunstable site, and they were able to keep the two-seater company as it beat solemnly up and down the same stretch of hill. By 3 a.m. on Sunday most people decided it might be a good idea to go to bed for the first time for nearly two days.

Much to everyone's disgust, Sunday, July 10, the first official day of the competition, started with low cloud and rain. A few hardy people rigged their craft and hill-soared in the drizzle to gain duration points. The rest sat with wet feet and drank innumerable coffees in the club-house. In fact, nothing of much interest happened at all, though occasionally strangers to the site flew themselves into peculiar positions.

Monday showed more promise, and aero-towing started soon after lunch. It seemed quite easy to begin a cross-country flight, but only from an aero-tow; cloud-lift was good, but did not appear to connect in an orthodox manner with ground thermals. Apparently only one good thermal passed over the site during the day. At 15.00 hours sailplanes hill-soaring in the bowl at the north end of the ridge were seen to start circling; almost immediately they were joined by every other one in the sky. The thermal was topped by well-formed cumulus cloud, which was drifting eastwards. Eight sailplanes were circling in its invisible updraught, slowly getting smaller and higher until eventually five had disappeared into the cloud. John Simpson, in a Kirby Kite, landed at

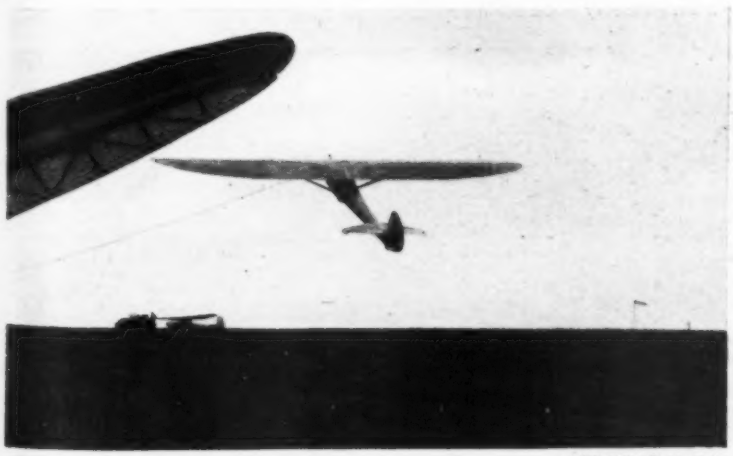
Grace: A fine aerial impression of a typical high-performance sailplane, Mr. Hiscox's Kirby Gull. The photograph was taken from a two-seater glider.

Duxford Aerodrome (34 miles), which he had declared as his goal ("Goal flights" were one section of the competition, and scored good marks.) Within a few minutes he was joined by P. A. Wills in the Minimoa, G. H. Stephenson in the Grey Kite, and A. B. Wilkinson in another Kirby Kite, while J. S. Fox, with the Rhönadler, landed two miles away.

The best flight of the day was that of Christopher Nicholson, in the Rhönsperber, who eventually touched down in the grounds of a girls' school in Lowestoft (104 miles). I. Pasold also made a goal flight to Norwich Aerodrome (96 miles). Many other pilots went for cross-country flights of anything up to 20 miles, several machines making two or more a day. Choice of landing grounds varied from playing fields to cornfields, and the unfortunate retrieving parties were, on one or two occasions, faced with merely a wing-tip visible out of the crops and an irate farmer following up in the rear.

Weather conditions on the Tuesday did not appear promising, as low cloud and rain persisted during the morning. Cloud lifted to two thousand feet shortly after lunch, and aero-towing started from Studham Aerodrome, but without much success, until R. P. Cooper was launched in a Rhönbussard; he made straight off from the tow for a black mass of cloud from which little bits of ragged vapour were hanging. He was right in his choice, for it turned out to be part of a "front" which took him to Colchester (62 miles). The flight was remarkable for the fact that Cooper had to circle only twice during the whole flight; the rest of the time he flew on a compass course under the cloud at an air speed of 70 m.p.h., occasionally putting on the spoilers to prevent himself being drawn up into it.

Thirty minutes after his departure another line of cumulus appeared from the same direction, the upper sky still being overcast. Wills was launched and utilised the good speed range of the Minimoa in beating up-wind towards the edge of the cloud-street. This seemed to



"Flight" photograph.

At the other end of the string: Mr. E. J. Furlong's Cambridge II zooms skyward in the rather emotioning fashion typical of the winch-launching. (Right) Flt. Lt. Murray and Mr. Stanley Sproule, who stayed aloft 22 hr. 13½ min., breaking the world's two-seater sailplane duration record.

be another instalment of the ragged front, for Wills was able to fly in rather the same manner as had Cooper. He landed at North Weald Aerodrome (32 miles).

The daily prize on the Wednesday was given for a goal flight to Lympne Aerodrome, which meant flying 40 deg. across wind. The morning was clear, with very small, flat cumulus, which started to appear as late as half-past ten, showing the presence of an inversion above them. Christopher Nicholson, in the Rhönsperber, was the only pilot to arrive at Lympne (96 miles), which was partly obscured by a thick haze. Three others tried to reach the same goal but landed short. Mrs. Joan Price, in a Rhönbussard, reached Sittingbourne (70 miles) in very thick haze, which was so bad near the Thames Estuary that at 3,000ft. she could see only directly below her. Sqn. Ldr. P. M. Watt flew round London to the west, *via* Brooklands, in an effort to avoid the murk, eventually landing at Cranbrook (72 miles in a straight line, although he had travelled nearly 100 miles in his detour). Wills landed the Minimoa ten miles from Canterbury (76 miles).

"*Flight*" *photograph.*

Promising cumulus: Mr. Philip Wills, inveterate long-distance pilot, prepares the beautiful Minimoa

"*Flight*" *photograph.*

Maj. Alan Goodfellow, Sir Francis McClean, and Mr. J. R. Ashwell-Cooke—all pioneer sponsors of gliding in this country—with Dr. Dewsbury in the Rhönsperber.

The most creditable flight of the day was undoubtedly that of the little H.17, which has a span of only 32ft., and had not been flown with any great success in this country; piloted by F. T. Gardiner, it flew 73 miles to Stowmarket, which proves its worth as a serious sailplane.

Other pilots flew to all the local villages and visited other pilots in neighbouring fields while harassed retrieving crews vainly tried to get the trailers up impossible hills, along impossible lanes, and through impossible gates. The total cross-country mileage for the day was exactly 1,000.

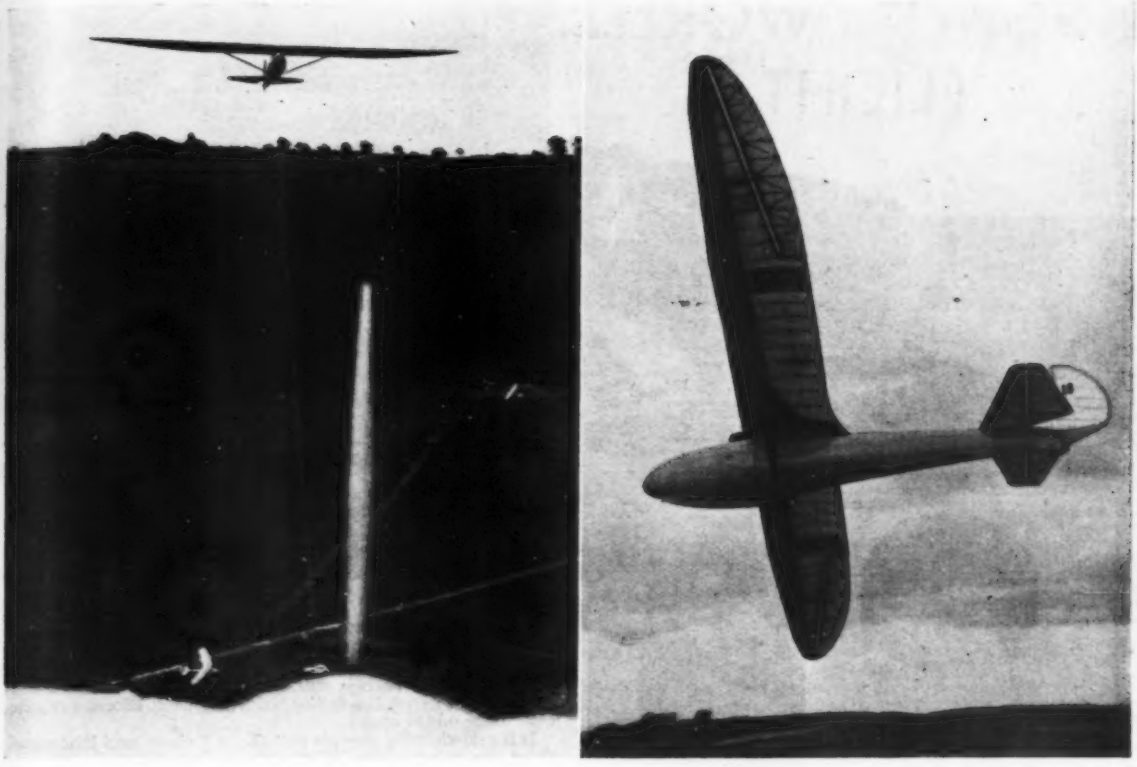
Thursday, again, was not a success as regards weather, and club entries tried to pile up duration marks in the rain. Aero-towing was carried out all day, and sailplanes were dropped at the 1,000ft. cloud-base. The race for the Seager Trophy started in the afternoon, the course being the hill-top wind-sock and the control tent near the club-house, which involved gaining enough height by hill-lift to strike out on a complete lap, returning for a beat along the ridge to gain height for the next lap.

Friday was similar, and no cross-country flights of any note were made; again there was an overcast sky and an almost complete lack of any but mechanical lift. The day ended with Flt. Lt. R. H. Shaw leading in the Seager Trophy race by three laps.

The forecast for Saturday morning was excellent, and pyjama-clad competitors were to be seen rigging machines at 6.30 a.m. in QBI conditions, which remained most of the day. The occlusion which had passed over on Friday had come back to pay another visit. By the evening the Derby Club's new Kirby Gull, piloted by G. O. Smith, had caught up Flt. Lt. Shaw in the race for the Seager Trophy. Shaw was flying the Grunau Baby No. 5 brilliantly, cutting everything as fine as he dare and flying only just above the stall to get the best out of the machine. In order to keep equal with the more efficient Gull he had to leave the lift area very low without waiting to gain any extra height. Invariably he would return to the hill 150ft. below the top and work his way up again in a way that seemed almost

"*Flight*" *photograph.*

Competing at Dunstable—the Tern, built by the Airspeed Company in their York days. Family resemblance is seen in the rudder.



(Left) **The Cambridge University Club's Cambridge I in tow behind an Air Publicity Avro 504, flown by Mrs. Crossley. This machine, with an Airwork Gipsy-Cadet, made some scores of tows during the week, operating from Mr. Alan Butler's private aerodrome near-by.** (Right) **A picture for students of wing design : The Imperial College of Science team's Kirby Kite.**

impossible even to the most experienced pilots watching.

The final day, Sunday, was at last a good cross-country one, and many sailplanes departed from both winch and aeroplane launches.

Meanwhile, the Seager Trophy was being fought to a finish. G. O. Smith, in the Gull No. 10, had started the day with a four-lap lead, but Flt. Lt. Shaw slowly caught up his handicap, and soon the two machines were lapping equally again. At the sixty-fourth lap disaster occurred; the Grunau left the hill very low, allowing no margin for a lull in the wind or error of any sort, and on the sixty-fifth lap it arrived back at the hill with insufficient height to soar again and had to land. There was no one close enough to challenge for second place, which was lucky for Shaw, as the tail-skid of the Grunau had broken during the take-off and had to be repaired before it could fly again.

Meanwhile, telephone messages were coming in from all over South-East England announcing distances achieved. The best was a 96-mile goal flight in the King Kite by Sqn. Ldr. Watt to Ramsgate Airport. Wills landed in a field near Sittingbourne (70 miles), Dr. Dewsbury reached Gravesend in the Rhönsperber, Peter Davis in the Rhönadler reached Hawkinge Aerodrome (96 miles), and D. F. Greig flew to Colchester in the Grey Kite, attaining the greatest height of the meeting (5,100ft. above launch).

And so the 1938 competitions ended. There was plenty of fun, in spite of the rather poor weather conditions; for instance, there were shows of gliding films in the club-house, including an extraordinarily clever cartoon, in the best Disney tradition, entirely drawn by Lawrence Wright, a member of the London Gliding Club. To finish it up, the writer went on a retrieving party, arriving back to an empty Dunstable and a slightly intimidating and back-to-earthish Monday morning.

* * *

A postscript, perhaps, might be added by a visitor who is still journalistically inefficient after the comforting hospitality offered by Mr. Hervey (the chief instructor) and Mrs. Hervey, not to mention Mrs. Turvey, who never appalled at the prospect of catering with incredible efficiency and inexpensiveness for several hundred ravenous enthusiasts. There is something particularly charming about the gliding fraternity. It will be a sad day if ever Dunstable Downs are ranged by ornamental gentlemen with angry moustaches and Very pistols.

Speed range : Early in the week Capt. Balfour, Under-Secretary of State for Air, flew the leisurely two-seater Falcon III with Mr. Hugh Bergel (left). A few days before Capt. Balfour had been piloting a Hurricane.

PROVISIONAL RESULTS

Open Contest.

		Points
1.	Rhönsperber (C. Nicholson, Dr. J. P. Dewsbury)	453
2.	King Kite (Sqn. Ldr. P. M. Watt)	445
3.	Rhönadler (J. S. Fox, P. B. N. Davies) ...	412
4.	Minimoa (P. A. Wills)	302½

Volk Cup (best duration of year).—Flt. Lt. W. B. Murray and J. S. Sproule (Falcon III), 22 hr., 13½ min.

Wakefield Cup (greatest distance of year).—P. A. Wills (Minimoa), 206 miles.

De Havilland Cup (greatest height of year).—P. A. Wills (Minimoa), 10,262ft.

Firth-Vickers Cup (best performance by all-British machine).—Sqn. Ldr. P. M. Watt (King Kite).

Manio Cup (best individual performance at meeting).—C. Nicholson (Rhönsperber).

Other Contest Prizes.

Height.—D. F. Greig (Kite), 5,100ft. above launch.

Distance.—C. Nicholson (Rhönsperber), 104 miles

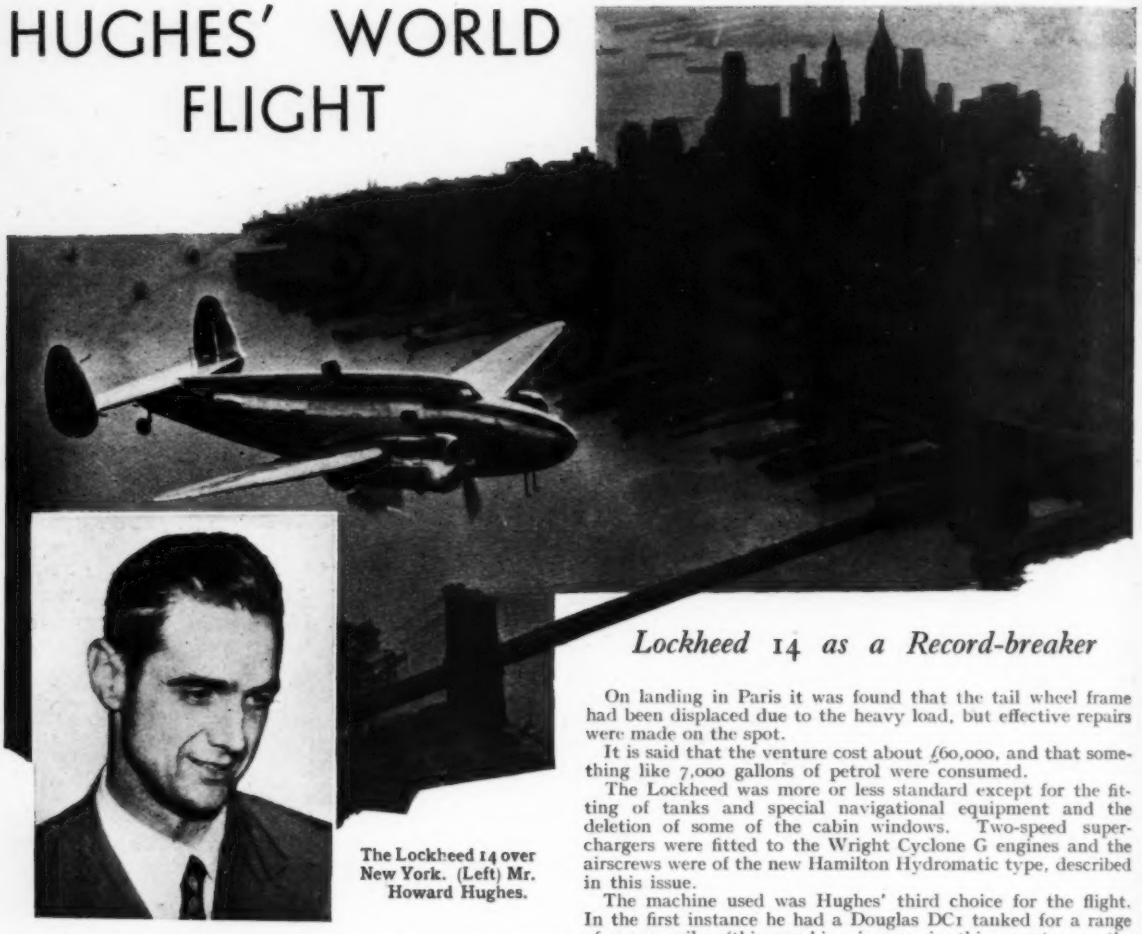
Duration.—V. Chirgwin (Kirby Kite), 6 hr. 15 min.

Inter-club Team (Open).—1, Cambridge I team (G. W. Pirie, G. Kidd), 282½ pts.

Inter-club Class (limited span).—1, Grunau Baby, No. 4 (J. Shepherd, G. O. Thompson, E. Swale),386.

Seager Trophy Race.—(1) Derby and Lancs. G.C. Kirby Gull ; A. Davies, L. R. Robertson, G. O. Smith ; 109 laps. (2) Grunau Baby team : Miss Ann Edmonds' Flt. Lt. R. H. Shaw, J. Saffrey ; 64 laps. (3) Cambridge II : E. J. Furlong, 17 laps. (4) Airspeed Term: G. A. Little, A. H. Reffell, 11 laps.

HUGHES' WORLD FLIGHT



The Lockheed 14 over New York. (Left) Mr. Howard Hughes.

ACCOMPANIED by Lieutenants Connor and Thurlow and Mr. Stoddard (wireless operator), Mr. Howard Hughes last week made a notable 14,874-mile trip round the Northern Hemisphere—not, as some newspapers have almost implied, a 24,900 one round the Equator. They used a specially prepared Lockheed 14 transport with Wright Cyclone engines. Mr. Hughes put the Lockheed down at Floyd Bennett airport, New York, at 7.37 B.S.T. last Thursday night, having averaged 214 m.p.h., excluding stops. The late Wiley Post previously held the record for a similar trip with a time of 7 days 18 hr. 49 min. The return of Hughes was greeted by a tremendous crowd of wildly excited New Yorkers.

The progress of the flight was:—

FIRST DAY

12.20 a.m.—Left New York for Paris—3,641 miles.
4.51 p.m.—Paris, 16 hr. 31 min.

SECOND DAY

1.24 a.m.—Left for Moscow—1,600 miles.
9.16 a.m.—Moscow, 7 hr. 52 min.
11.33 a.m.—Left for Omsk—1,500 miles.
7.00 p.m.—Omsk, 7 hr. 27 min.
11.37 p.m.—Left for Yakutsk—2,177 miles.

THIRD DAY

10.8 a.m.—Yakutsk, 10 hr. 31 min.
1.1 p.m.—Left for Fairbanks—2,456 miles.

FOURTH DAY

1.20 a.m.—Fairbanks, 12 hr. 19 min.
2.38 a.m.—Left for Minneapolis, 2,500 miles.
2.38 p.m.—Minneapolis, 12 hr.
3.13 p.m.—Left for New York, 1,000 miles.
7.37 p.m.—New York 4 hr. 24 min.

Slight delays were occasioned by the absence of interpreters in Russia and the lack at some points of power-worked petrol pumps. The Fairbanks-Minneapolis run was the worst section, it was flown in darkness and at such a height as to necessitate the use of oxygen. The weather was the worst Hughes had encountered on the whole trip.

Lockheed 14 as a Record-breaker

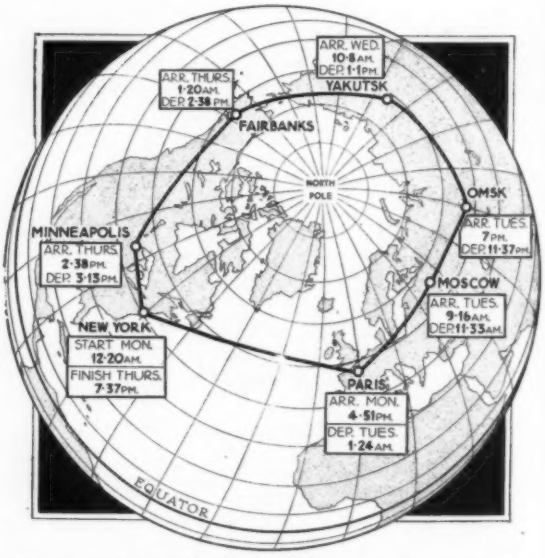
On landing in Paris it was found that the tail wheel frame had been displaced due to the heavy load, but effective repairs were made on the spot.

It is said that the venture cost about £60,000, and that something like 7,000 gallons of petrol were consumed.

The Lockheed was more or less standard except for the fitting of tanks and special navigational equipment and the deletion of some of the cabin windows. Two-speed superchargers were fitted to the Wright Cyclone G engines and the airscrews were of the new Hamilton Hydromatic type, described in this issue.

The machine used was Hughes' third choice for the flight. In the first instance he had a Douglas DC1 tanked for a range of 5,000 miles (this machine is now in this country as the property of Lord Forbes), and secondly he intended to use a Sikorsky S-43 twin-engined amphibian.

The Lockheed 14 has been adopted, in modified form, by the Royal Air Force as a general reconnaisance machine and bomber.

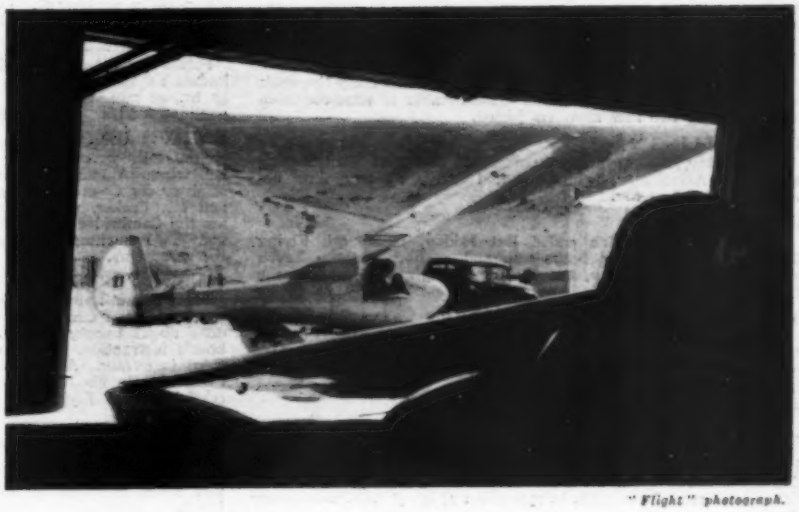


This map shows "hops" and times at a glance. It also indicates that to talk of Hughes' achievement as a "world-encircling" flight is hardly accurate.

PRIVATE FLYING

Motorless

AFTER last week's affair at Dunstable I don't really need an excuse for writing about gliding in general and soaring in particular. But since I may justifiably be shot down by the gliding experts for my ignorance and by the earnest power-aeroplane go-placers for letting the side down (chaps), I make this my excuse—though I have another perfectly good one in that, what with aerodrome owners' conferences and other things, the only flying in the private category (whatever that may mean) I have done during the week ended July 18 (*vide* almost any Club news paragraph) has been in a two-seater sailplane. Very little, indeed, and not for the first time, but enough to provide one or two new angles on the subject.



"*Flight*" photograph.

Anyway, at the present (if temporary) rate of decline in private ownership and club flying, and at the present (if temporary) rate of increase in military preparations, this "private flying" may in due course, indeed, consist very largely of motorless wanderings more or less in free balloon style, *i.e.*, the wind is blowing from the south-west, therefore we must visit Uncle Ned; if the wind was blowing from the east we should be forced to see some other relative.

There is, in fact, a certain amount of similarity between the grand old sport of free ballooning and the modern one of down-wind flying in sailplanes. The difference is that the sailplane pilot may fly across wind, or even up-wind, while the intrepid balloonist just ate his sandwiches and hoped for the best—peering over the edge of the basket from time to time to make sure that the blessed thing was not drifting over open sea. And to point out this similarity is not being insulting, either; I've often wanted to go ballooning myself, though perhaps yachting provides a better comparison.

For the present, however, there are power aeroplanes still available, and the growing military air fleets of the world have not yet used up all the available fuel supply. Many of the sailplane pilots fly power aeroplanes when they want to—some of them are even professional pilots—so what exactly is the attraction of this motorless business?

For the Sake of It

TO start with, we must divide pilots into two schools—those who fly just because they like it, and those who fly because they want to get somewhere. The second group do not come into the problem at all; its members will continue, sensibly, to make use of an efficient petrol engine.

So shall I. But there are times when one wishes merely to gambol gently about the sky and to appreciate the feeling of the air beneath and around you. Believe me, in a sailplane the air *can* be felt—every lump in the mattress—and if you want the sensation of sheer speed, then I know of none quite as pleasant as that of whistling downwind along a hillside with one's wing tip practically taking off the spectators' hats.

Then there is that positively kingly realisation that height is actually being gained without pedalling. Admittedly, it is necessary to stay around in the same place in order to gain this height, but I've already explained that, for the moment, we are flying for the sake of flying and not to get to Hogsnorton or Little Rumbling for a drink before closing time.

Topics of the Day

All of which concerns mere hill-soaring. With the use of a little imagination it is not difficult to see the even greater attraction of more serious soaring; of spending an hour or more in gaining two thousand feet and of making use of some of this hard-earned height in pushing on ten miles or so and feeling for another thermal. Maybe it is even enjoyable to sit in the middle of a big black cloud and be sucked up to the top. Maybe.

Comparisons

IN a sailplane, practically for the first time in your life, you *feel* the air, and that seems to me to be one of the more important things. I was very, very kindly allowed to do an approach myself (with much verbal assistance and some slight fear of under- or over-shootment) when I was in a two-seater at Dunstable last week. There is certainly very little air to be felt on the control surfaces, and I should imagine that one soon becomes accustomed to the idea of holding off bank in a turn to the extent of full opposite aileron. In any case, this particular two-seater, I was told, is not at all typical, and the average modern sailplane has controls which are quite reasonably sensitive. The point is that it is possible to make even the two-seater do exactly what one wants it to do, and it sideslips with magnificent *élan*. Who cares about sensitivity? It's only the way in which one is brought up.

A friend of mine who was recently taken up in a sailplane after a good deal of power aeroplane experience says that he felt really safe in a flying machine for the first time in his life. That, I think, is exaggerating. But a sailplane certainly lands slowly, and does not carry a charge of liquid dynamite on its travels. As a confirmed power pilot, the feeling of security was slightly dulled for me by reason of the fact that no reserve urge was available in case of under-shootment, though I had no doubt about my pilot's ability to turn quickly and to put the machine down in any other field if necessary.

If this passenger enthusiast had flown power machines he would, too, have found winch-launching a very unnatural procedure and been suitably horrified at the idea of pulling the stick right into the pit of one's stomach just as soon as the machine is properly air-borne—and of holding it there. But the initial acceleration is a special joy at present denied to all but sailplane pilots, a few catapulted Service pilots and the pilots of the D.L.H. Atlantic machines.

INDICATOR.

Private Flying

FROM the CLUBS and SCHOOLS

LONDON

THERE was a considerable improvement in the number of flying hours put in by the London Aeroplane Club last week; these totalled a little over 119. Mr. H. Green made his first solo and three new members joined.

MARSHALL'S

The total flying time for Marshall's Flying School during the week ending July 17 was 46 hours. The usual number of cross-countries were flown and two new members joined.

WEST MALLING

Next Sunday, July 24, a dawn patrol will be out at West Malling aerodrome. Attacking machines should arrive at any time between 8.30 and 9.15 a.m.

EDINBURGH

During the week which ended last Friday, Edinburgh Flying Club members put in 35 hours solo and 23 hours dual. Seven machines visited Macmerry, and two new flying members joined the club.

HERTS AND ESSEX

Flying was suspended owing to bad weather on two days during the fortnight which ended on July 14, but despite this the total flying put in during the period was 139 hr. 5 min. Mr. E. H. Statham made his first solo and, with Mr. A. C. Tupper, completed his "A" licence test. Five new members joined.

LEICESTERSHIRE

An attack on the club's daily hourage record will be made next Sunday, July 24. Machines will fly to the breakfast patrol at West Malling, to Hatfield to lunch, and to Woodford or Ringway for tea. The present record was made in 1936 when 24 hr. 50 min. were flown one day.

YORKSHIRE

In spite at what the club secretary alludes to as "the shocking state of the weather," the Yorkshire Aeroplane Club's flying total for last week was as high as 129 hours. Taxi trips were made to Renfrew and Belfast. The same weather, however, caused the postponement of a cricket match which had been arranged between the club and No. 609 (B) Squadron.

NORTHAMPTONSHIRE

During the past few weeks there has been a considerable influx of new members at Sywell, including five flying and twelve associates. Mr. R. G. Lewin made his first solo. The club's chairman, Major G. R. D. Shaw, has acquired a new Hornet Moth, and on Wednesday of last week three club private owners, Messrs. G. and A. J. Linnell and H. Deterding, left for the Belgian Rally.

HANWORTH

During last week the London Air Park Flying Club put in 97 hr. 55 min., Miss M. von Einseidel passed her "A" licence test, and six members joined. The competition for the A.E.M. Challenge Trophy will start on Wednesday, August 20, the finals being flown off on Sunday, August 31. Entry forms for the competition must reach the secretary not later than August 28. Three more Aeroncas were delivered during the week, bringing the total number of these machines in use by the club to nine.

NORFOLK AND NORWICH

The club has recently acquired a Gipsy III Moth fitted with glider-towing equipment. During last month there were 134 arrivals and departures from Mousehold.

HAMPSHIRE

Pupils and others at the Hampshire School of Flying—previously known as the Hampshire Aeroplane Club—put in a total of 47 hr. 45 min. during the week ending July 15. Mr. E. Smail qualified for his "A" licence.

BARTON (BEDS)

First solos were made by Messrs. A. R. Dixon and J. T. Unwin last week. Among the visitors were Mr. Hopkinson, M.P., of the Ministry for Co-ordination of Defence, Cdr. G. C. R. Evans, R.N., and Mr. Parker, who put down a sailplane which he was flying for the Cambridge University Gliding Club in the Dunstable meeting. Two machines flew over to Luton for the official opening of the aerodrome.

CINQUE PORTS

Sixty hours' flying were put in last week, and Mr. T. W. Beckett went solo after two years' absence from the air; previously he had done about twenty minutes solo, but he was pushed off after an hour's instruction. Mr. R. J. Omnanney has joined the staff as third instructor. Among the visitors was Mr. C. Nicholson, who came over in his Rhönsperber sailplane from Dunstable on a successful "goal" flight. He had been in the air for five hours.

SOUTHEND

Quite a large party of members attended the Luton aerodrome opening last Saturday, and with the better weather conditions during last week there was a considerable increase in flying. Three new flying members joined the club. There will be an open handicap race over a fifty-mile triangular course on the occasion of the club's "At Home," which will be held on Saturday, August 27. There will be three cash prizes of £25, £15 and £10 for the winner and runners-up respectively.

SOUTH COAST

During last week the South Coast Flying Club flew 36 hours, including first solos by Messrs. A. Farnfield and N. E. Ward. Two new members joined. On Saturday Mr. Pashley, the chief instructor, gave a bombing demonstration with a club machine at the Brighton Regatta. On the following day the arrival competition was won by Capt. Duncan Davis, and a prize for the best turned-out machine taking part was won by Mr. L. Bellairs with his Whitney Straight.

BROOKLANDS

A formation of club machines attended the opening of Luton aerodrome last Saturday, and on the following day most of them went over to Shoreham for the arrival competition which was won by Capt. Duncan Davis himself. On Sunday afternoon the hundred bags of flour which had been obtained for the bombing competition were found to be insufficient. Members had to try to hit Mr. Collins, the ground engineer, who was bravely stationed in the centre of the circle; fortunately for him nobody was quite successful and the winner was Mr. Waterfield. Next Sunday another of the series of handicap competitions, this time a map-reading event, will be flown off.

At Deauville

LAST week-end's Deauville Rally, in spite of rather mixed weather, was all that such an affair ought to be. That is to say there is very little to report officially, though the 130- or so British participants, who flew over in seventy machines, had plenty of fun individually. The Misses Glass won the arrival competition in their venerable Moth, Mr. Giles Guthrie came over in fifty minutes from Lympne with his Mew Gull and Capt. Percival travelled from Luton in the Q.6 in an hour or so—remarkably fast aeronautics when one looks on the map and sees that Deauville, unlike Calais, is not by any means just across the ditch. Among the English participants was Air Marshal Joubert de la Ferté, who arrived in a Dragonfly.

Private Strip

APART from the facts that it was opened on July 9 by no less a person than the Marquis of Londonderry and that among the guests was Lt. Col. Sir Francis Shelmerdine, the Director-General of Civil Aviation, the Hon. Charles Winn's private aerodrome at Nostell Priory is of special interest. It is, in fact, a strip landing ground with natural wind "buffers" in the form of tall trees along each side of the 150 ft. by 1,500 yd. runway.

Whether or not the trees will be sufficient to break the force of strong cross-winds remains to be seen. At any rate, the sudden cessation of drift as a machine glides below the tree level will demand an interesting flying technique which will provide practice, perhaps, for the days when steerable tricycles make the single-strip airport a commercial possibility. On Saturday the 50 m.p.h. wind happened to be blowing straight down the strip, and none of the visitors found any difficulty in putting down and pulling up even before the circle had been reached.

During the afternoon various machines were demonstrated in the style familiar to those who visit airport openings on a larger scale. Among them was a Percival Q.6 flown by Capt. Percival himself; Mr. F. G. Miles with a Monarch; Mr. Frank Steinman, an American pilot, with a Stinson Reliant; Mr. R. A. C. Brie (very suitably) with a C.30 Autogiro; and Capt. C. W. Bebb with a Tiger Moth. Additionally, Pilot Officers Boulter and Nicolson came over with two Gauntlets and gave a fifteen-minute aerobatic show.

Devon Air Day

ON July 30 Sir Kingsley Wood, busy as ever, will fly to Exeter to open the new building and airport at Honiton Clyst. The ceremony will be at 2.30 p.m. and Devon Air Day will follow.

Apart from the usual Service and civil events, there will be three interesting visitors from abroad, two of whom will put up characteristic aerobatic displays. Herr Herwath Wendel, who was prevented by weather from coming over to the Ipswich opening, will be flying his Bücker Jungmeister mainly in an inverted attitude and probably at zero altitude, and Dip. Ing. Kropf, who may be considered as Flt. Lt. Christopher Clarkson's opposite number with Intava in Germany, will give an aerobatic display with a Focke Wulf Stösser which will be brought over by Dr. Scherzer; Kropf will himself bring over a B.F.W. 108 monoplane for demonstration.

Among the Service events will be an aerobatic display by machines from No. 151 (F) Squadron from North Weald and a demonstration of air drill by machines from No. 22 (T.B.) Squadron from Thorney Island.

AND STILL ANOTHER

Fourth Aerodrome Ceremony within a Month: The Air Minister Opens Luton: Mayo Composite Demonstrated

WHETHER the Air Ministry and others were taking Luton's claim of the suitability of its aerodrome as a London terminal quite seriously, or whether it was merely an example of the way in which the new Air Minister is endeavouring to give the public the best possible idea of military and civil flying developments, the fact remains that there were probably more types of real interest at the official opening of Luton's aerodrome last Saturday than have appeared together for a considerable time.

The high spot of the afternoon was undoubtedly the appearance of the Short-Mayo composite machine and the act of its separation at quite low altitude over the aerodrome. This is the first time that the machine has been publicly demonstrated, and the event was of particular interest because by now *Mercury* should, according to plan, be on its first Atlantic crossing after being launched from *Maia* over the Shannon Estuary.

Although it was previously known that there was a strong possibility that the Mayo would be able to put in an appearance during the afternoon, there was not sufficient certainty for the event to be included in the official programme, and its appearance certainly made up for the fact that the A.W. Ensign was not on view. After the separation, *Maia*, flown by Capt. Wilcockson and carrying, among others, Capt. Lamplugh (who has the responsibility of insuring the pair), was taken round the enclosures at low altitude and this incidental demonstration took the place of that of the Empire boat which was originally (if impossibly) expected after its flight from Australia. To the layman's eye the only difference, however, between *Maia* and the standard boat is in the superstructure which, for some curious reason, adds considerably to the impression of great size which is always noticeable when flying boats are being demonstrated over land aerodromes.

Another surprise event was the parachute descent (or, to be more exact, descents) by Herr Seimondl. These were made from a paralysingly low height with the Eschner parachute, the advantage of which is that it opens at once. Luckily it did so in each case, for Herr Seimondl's third jump was made at a height which could not have been much greater than 150ft. Unfortunately, though very few people noticed it, the canopy was torn on this opening and it is possible that, had the drop been made from a considerable height, it would have disintegrated. However, this incident did not in the least detract from the effectiveness of the demonstration. The Eschner has no pilot parachute and the entire canopy is apparently shot out of its pack more or less in one piece by means of a spring. It is claimed that no special technique is necessary in packing the parachute.

"*Flight*" photograph.

There was a strong Service support; here are Fairey Battles of No. 218 (B) Squadron from Boscombe Down.

"*Flight*" photograph.

Sir Kingsley Wood pronounces the magic formula. On his right is Col. Sir Francis Shelmerdine.

Altogether the flying display after the official opening was very well arranged, with practically no pauses in the interest and no anti-climax except the inevitable one after all the events had been run through. The Royal Air Force part of the show started with a most effective demonstration of individual aerobatics by F/O. A. C. Douglas flying a Hawker Fury—a type which can still be depended upon to provide the necessary effects of power and speed. The more modern fighter, as exemplified by the Hawker Hurricane which was flown by Sq. Ldr. J. W. Gillan later in the programme, will probably never have quite the same public-incitement value except in the matter of sheer maximum speed.

Educational

In spite of the very considerable bumps, the flight aerobatics by three Gloster Gladiators from Hornchurch were magnificently carried out, the effectiveness of the demonstration being increased rather than otherwise by the low cloud which meant that quite often the three machines disappeared for seconds at a time, to reappear in exactly the same perfection of formation.

Modern trends in design for other military purposes were represented by the A.W. Whitley as a night bomber, the Westland Lysander for Army co-operation, and a complete squadron of Fairey Battles as the first of the new type of light bombers. The Battles were flown in different formations over the aerodrome and at a sufficiently low altitude to give the necessary programme demonstration of "low-level attack." The programme, incidentally, went to explain that, apart from pom-poms, "the most effective deterrent against raiders flying boldly at low heights will be the Balloon Barrage Squadrons of the A.A.F."

Finally, the Hurricane provided the climax in fighter modernity.

Speed in civil form was demonstrated by Capt. Percival—who, a little later, cleared Customs and left for Deauville in the Q.6—with the Mew Gull which

(Above) Herr Seimondl, wearing the Eschner parachute, embarks in a Luton Club Tiger Moth (flown by Mr. E. W. Bonar) preparatory to making the low altitude departure shown on the right. The torn canopy can be seen.

he flew in the King's Cup Race; by Cdr. Flowerday with a British Airways Lockheed Electra; and by the first of the Albatrosses, which was brought over from Martlesham for the event. One wonders whether the particularly harrowing noise of the constant-speed airscrews in fine pitch and driven by an ungeared engine is a too-effective introduction to modern airline travel, or whether, without the necessary explanation over a loudspeaker, single-engine flying is really appreciated by the general public.

Freight

Duly impressive was the loading, in full view of the populace, of an International Air Freight Condor with motor car parts and boxes of hats which were flown away to Croydon and brought back later in the same machine while nobody was looking. Among the many other machines which were brought over to be demonstrated, either officially or unofficially, were the C.30 autogiro (Mr. Brie at his best), the Miles Magister and the Miles Monarch flown respectively in an already packed sky by Messrs. Skinner and George Miles, the two-seater Tipsy and a brace of Aeroncas which were accompanied (and, we fear, overtaken) by an old 504 Avro trailing streamers which implored the public to buy British Aeroncas. Not to mention Fanny Flycatcher, which was built up, apparently, of the various motorised agricultural implements; this should, one supposes, really be included among the Service types. Here was the much-advertised mystery item; it must be admitted that the page devoted in the programme to its description was not unfunny and, in parts, quite libellously pointed.

To match the Eschner performance, another drop was made at the same time, from 1,200ft. or so, by Miss Ray Clark with a G.Q. parachute.

The opening ceremony was, of course, performed by Sir Kingsley Wood, who arrived in the Air Council's D.H. 86B.

"Flight" photograph.

Sheltering under the Albatross.

He was introduced by Ald. J. T. Harrison, the Mayor of Luton, and afterwards went round to the Club building to give the Luton Flying Club his official blessing. It was only during the speeches and ceremony that there was any slight hitch in the programme. Unfortunately, the entire ceremony was a minute or two late and the result was that an H.P. Hampden (luckily a very silent machine), and the Brooklands formation, which also arrived on stop-watch time, flew over the dais right in the middle of the proceedings. The only other criticism is that a running commentary, though extremely helpful, can be a little too running—with the result that people stop listening.

Unobtrusively enough, during the proceedings, two sailplanes put down on the aerodrome, one, flown by Miss Amy Johnson, deliberately and duly announced, and the other, flown by Mr. Philip Wills, accidentally and duly ignored. The denizens of the cheaper enclosures were the only ones to have a chance of appreciating the lines of the Gull and, particularly, of the Minimoa. The latter was aero-towed off in due course.

The arrival competition, the zero minute for which was 11.47 a.m., was won by Mr. E. A. Strautts, from Canterbury, the runners-up being Mr. R. Ward (all ignorant of his good fortune, even at the time of going to press), of Heston, and Mr. V. Hyslop, also of Canterbury.

(Below) Variety: Sqn. Ldr. Gillan's Hurricane flies over an International Air Freight Condor; on the left is Capt. Percival's Mew Gull, and in front of the Condor is a Magister.

"Flight" photographs.

COOLING DEVELOPMENTS

New French Schemes and Some General Considerations

AS in most branches of aircraft design, details about the many experiments at present in progress on cooling systems are generally withheld because of their secret nature or because the designer is anxious first to reach some degree of finality in his particular line of research.

At the moment the best position for the radiator on "wet-nosed" types seems to be a very controversial matter. Considering specific aircraft types, the Whitley IV and Henley show examples of nose-positioned radiators. The Battle, as supplied to the R.A.F., on the other hand, has a radiator just below the rear end of the engine in the mid-ventral position, while Battles for Belgium, by extension of the radiator intake fairing, are in effect a compromise between the two above-mentioned types.

The Hurricane exemplifies an installation of the ventral radiator, placed midway beneath its belly. The Spitfire appears to be similar when viewed from the side, though actually the radiator is offset below the starboard wing root.

The fact that the instances quoted all involve the Merlin engine is a coincidence; on the other hand, it demonstrates that the various positions are not dependent on a certain engine type—that is, a Merlin does not always require the ventral-placed radiator or the Kestrel the nose position.

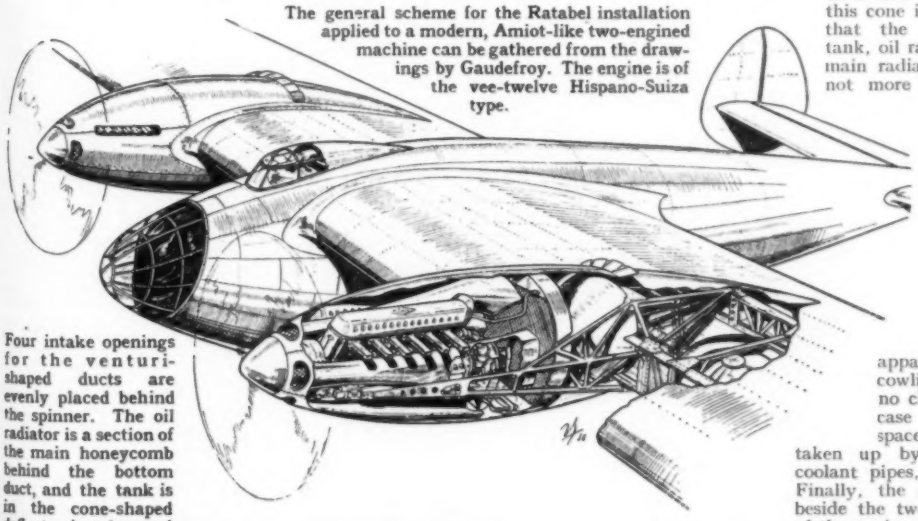
If one were asked to single out any one of these locations as the most favoured at present the choice would probably be the nose position, if for no other reason than that it conforms with the current tendency to produce the engine, its mounting, and all but a minimum of controls and pipe lines as one detachable unit of the aircraft.

A French patent has recently been taken out by M. Ratabel dealing with a rather novel cooling scheme. One more step in the campaign to reduce cooling drag, this installation provides for a combined oil and coolant radiator to be placed directly behind a vee in-line engine in the form of a bulkhead.

The D.H. Gipsy Twelve installation, showing air duct entries set out at two-thirds of the airscrew diameter.

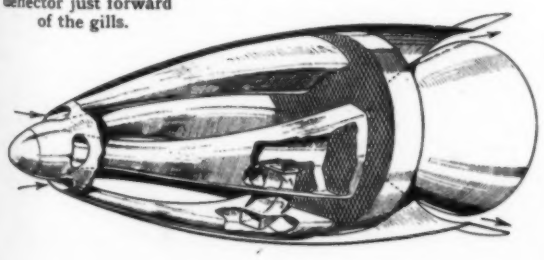
Cooling air, taken in at four flush openings placed immediately behind the airscrew spinner, is led to the radiators through four curving ducts of venturi shape. Except at high speeds, it is hard to see how sufficient cooling air is obtained from these points.

Behind the radiator, which is almost circular to follow the cowling lines, is a cone-shaped internal fairing which directs the air out through an annular slit controlled by gills, as in air-cooled radial practice. Into this cone is built the oil tank, so that the distance between oil tank, oil radiator (a section of the main radiator), and oil pumps is not more than three feet, thus avoiding the use of long oil pipes.



The general scheme for the Ratabel installation applied to a modern, Amiot-like two-engined machine can be gathered from the drawings by Gaudefroy. The engine is of the vee-twelve Hispano-Suiza type.

Four intake openings for the venturi-shaped ducts are evenly placed behind the spinner. The oil radiator is a section of the main honeycomb behind the bottom duct, and the tank is in the cone-shaped deflector just forward of the gills.



The installation shown in the drawings (from our contemporary, *L'Aeronautique*) is certainly clean and pleasing to the eye, but difficulties in applying the ducts to our Merlin or Kestrel engine are at once apparent. In present Merlin cowlings there is practically no clearance between crank case and fairing, while all space between the banks is taken up by induction manifolds, coolant pipes, and ignition harness. Finally, the depressions below and beside the two blocks at either side of the engine at present contain such accessories as generator and v.p. airscrew controls, and the generator, though presumably these could be located elsewhere without much difficulty. The scheme would appear to lend itself even better to a large liquid-cooled X-shaped engine.

A 1/20-scale model is being made of this project for tests in the wind tunnel at Issy-les-Moulineaux.

Both liquid- and air-cooled installations of larger engines, regardless of cylinder arrangement, are tending to resemble each other more and more as each approaches the perfectly streamlined form. The Gipsy Twelve is an example of a totally enclosed air-cooled in-line engine, cooling being by ducts, feeding from the rear of the unit. News, too, has recently been received of machines equipped with the new

(Left) The position of the nose slot on the N.A.C.A.-cowled two-row Whirlwind engine. (Right) The French Lioré 45 bomber fitted with Mercier cowlings. The engines are Hispano-Suiza two-row 14 AA radials. The oil cooler seen on the leading edge outside the port engine will be enclosed in the cowling on production machines.

Mercier radial engine cowling incorporating a smaller intake opening and slotted forward air outlet. The belief is that the drag is unnecessarily high on radial engines and that by cutting down the size of cooling opening it can be reduced.

A slightly extended airscrew shaft with a large and shapely spinner and the smaller slotted opening in front of the cylinders (followed by a long-chord, carefully faired cowling) gives to the Mercier radial cowling a distinctly "in-line" appearance.

Important developments may be expected from America in connection with the N.A.C.A. nose-slotted cowling. Full-scale tests of one installation have been made, the machine being a Curtiss BFC-1 biplane with two-row fourteen-cylinder Whirlwind engine. These experiments were made more with a view to increased cooling efficiency at low speeds than to improve the aerodynamic form of the cowling.

The airflow is through the central front opening of the cowling, round the baffles and back over the cylinder heads to a guide ring for the forward slot.

Certain special conditions of detail design were found to be important. The exit opening should be located so that the low-energy air converges into the main stream ahead of the point of maximum velocity. Since there are times when good cooling is necessary from the airscrew slipstream only, a two-slot design is recommended, in which one slot is controlled.

Should a scheme be developed for radially disposing the radiator of a large liquid-cooled in-line unit round the airscrew shaft between spinner and cylinder banks, we should, in effect, have the missing link between radial and in-line cowlings. Such an arrangement would most logically lend itself to X or H formation of cylinders.

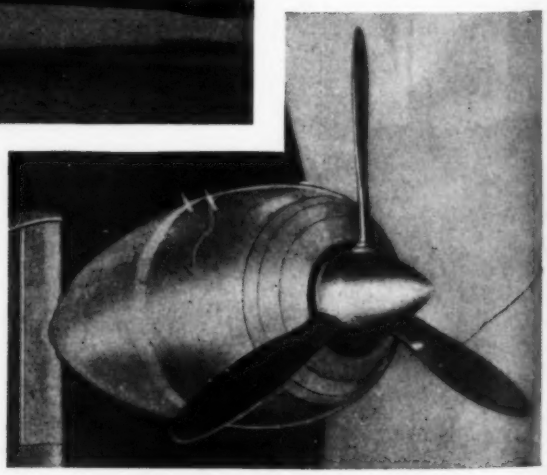
The first-named arrangement might actually be regarded as a multi-bank radial engine.

(Left) An example of the nose radiator position. The Whitley IV has Rolls-Royce Merlin IV engines.

(Bottom left) The Spitfire has a ventral radiator which is, however, unusual in being considerably offset to starboard.

"Flight" photographs.

(Below) A wind tunnel model of the Mercier cowling.

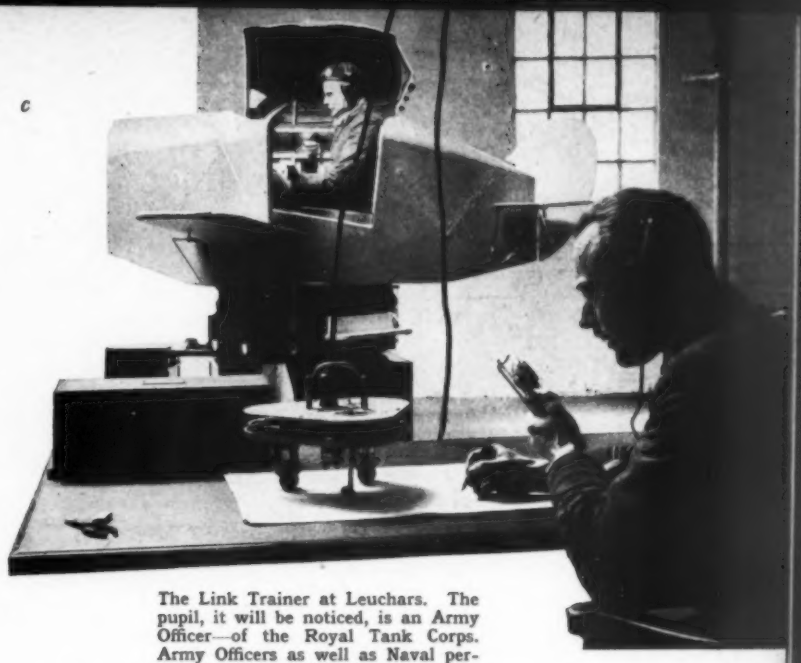


R.A.F. UNITS VISITED

No. 1 FLYING TRAINING SCHOOL, LEUCHARS

By Major F. A. de V. ROBERTSON, V.D.

Illustrated with "Flight" photographs



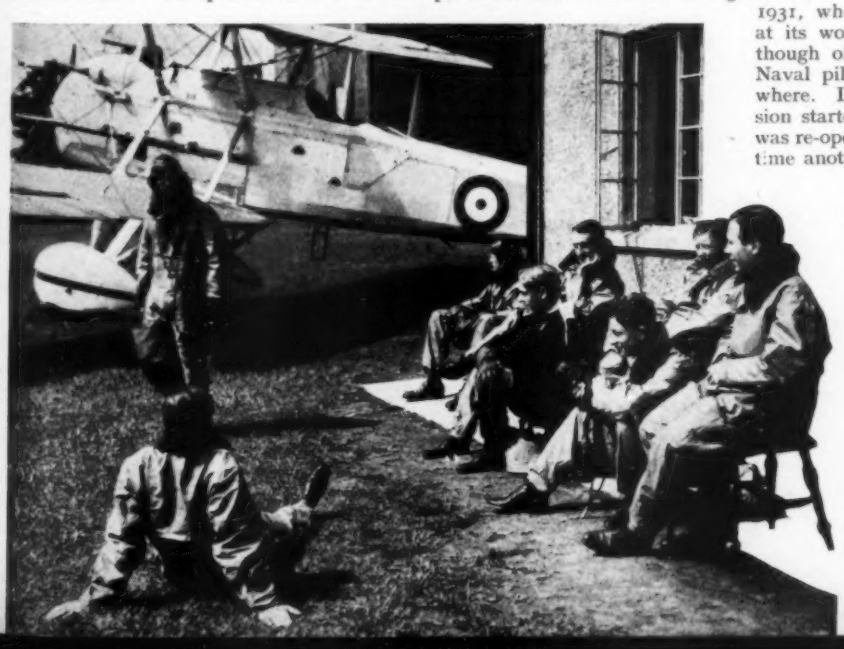
The Link Trainer at Leuchars. The pupil, it will be noticed, is an Army Officer—of the Royal Tank Corps. Army Officers as well as Naval personnel receive their flying training at No. 1 F.T.S.

SOUTH for sunshine, say the posters in many railway stations; but canny Scots, who know a bit more, say "Go to the Kingdom of Fife, or, if you prefer them, the counties of Ayr and Angus." The ignorant Southron may ask why Fife should be called a Kingdom. It was not specifically mentioned during the Coronation ceremony in Westminster Abbey, and the stone in the Coronation throne on which the Kings of Scotland were once crowned up to the days of Robert the Bruce, and again since the union of the crowns under James VI and I, came from Scone, not from anywhere in Fife. Well, let historians answer that question; the fact remains that if you want to be popular in Fife you must hail it as a Kingdom. From the R.A.F. point of view, the important facts are that there are more good flying days in the year at Montrose, Prestwick, and Leuchars than at any other stations in the British Isles.

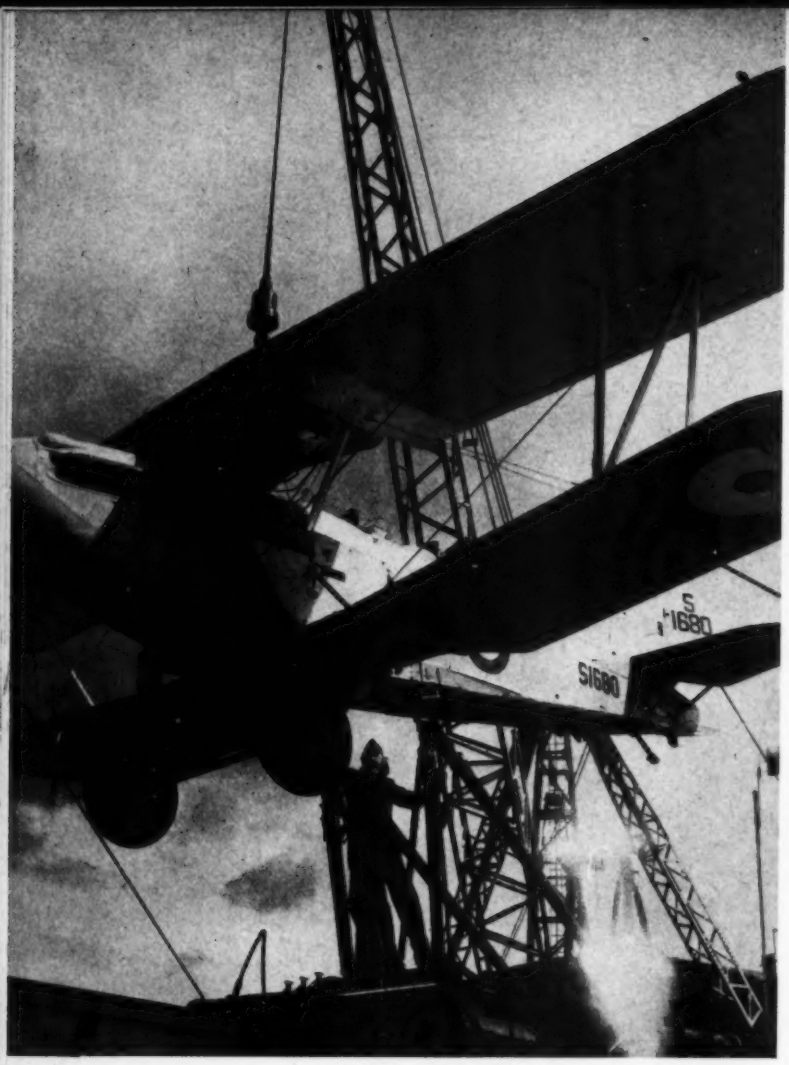
So, armed with Air Ministry permits, we went in search of sunshine to Leuchars in Fife. Unfortunately, on the day of arrival, the late lamented drought came to a watery end, and photography was out of the question; but next day the sun thought better of it, and Leuchars became its own brightly, windy self again. Given the usual sun, Leuchars is a very pleasant place, with a large and good aerodrome. Its charm is enhanced by the proximity of St. Andrews with its old-world University and its Royal and Ancient only a few miles off across the bay. It does not take long in a car to get into the Highlands.

Leuchars is for the present the home of No. 1 Flying Training School. There are ten F.T. Schools in Great Britain and one in Egypt, but among them No. 1 F.T.S. stands alone. Its special work is to train pilots for the Fleet Air Arm, not R.A.F. men but naval officers, officers of the Royal Marines and Naval ratings. Army officers who receive temporary commissions in the R.A.F. and are destined to fly in the army co-operation squadrons also are taught to fly at Leuchars. Exactly why the Army men are sent there is a bit of a conundrum. There are not many of them, and probably those responsible for arranging such matters thought that all who come from other Services and only hold temporary commissions in the R.A.F. might as well be taught at the same F.T.S. Of course, the Army men are not ready to join the A.C. squadrons when they leave the F.T.S., where they have learnt to fly but not to reconnoitre for the Army. They have to go for a finishing course to the School of Army Co-operation at Old Sarum. When the Admiralty takes over the complete control of the Fleet Air Arm there may, of course, be changes in No. 1 F.T.S., but as the Air Ministry is to remain responsible for the flying training of Naval pilots the changes will not be too drastic. At any rate, for the present, No. 1 F.T.S. is a happy family composed of all three Services, the flying instructors belonging to the R.A.F., but there is a predominantly nautical flavour in the work of the school.

One big change which is impending is the move of the school from Leuchars to Netheravon. This is due to take place on August 26. Netheravon was the original home of this school, which was formed there in 1919 with the title of Netheravon Flying School. At the end of that year the title was changed to No. 1 Flying Training School. In 1931, when the economy stampede was at its worst, the school was disbanded, though of course the flying training of Naval pilots had to be carried on elsewhere. In 1935 rearmament and expansion started with a rush, and the school was re-opened at Leuchars. In the meantime another F.T.S., namely No. 6, has occupied Netheravon, but that is to move to the new station of Little Rissington, near Stow-on-the-Wold in the Cotswold Hills, to make room for No. 1 F.T.S. The whole school will be sorry to



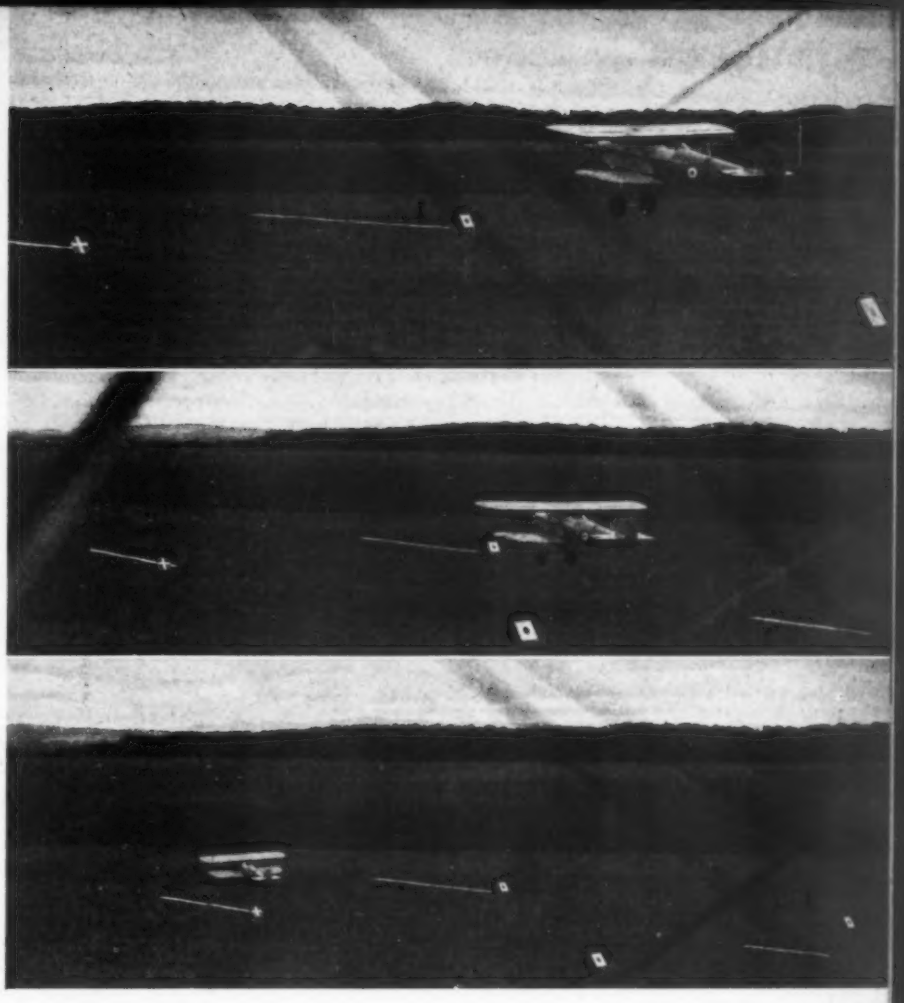
An informal group: officers under instruction awaiting their turns to fly. They are mostly Naval officers, but the possession of a moustache in one case indicates a military man.



leave Leuchars, which, as was mentioned above, is very popular, but Naval men are used to shifting quarters, and they will doubtless soon grow fond of the country round Salisbury Plain.

From 1935 up to the time of the move, No. 1 F.T.S. has differed from the other training schools in its curriculum. At all the other schools in the country the pupils are put through their elementary stage at a civilian flying school, where they are trained up to the standard of an "A" licence. At the F.T.S. they first pass through an intermediate training squadron and finish off in an advanced training squadron. At Leuchars things are done differently. They have taken the pupils in the raw and have given them their elementary course themselves. They use different terms, speaking of periods "A," "B," or "C." In "A" period the pupils are taught to fly on Tutors. Then they pass to "B" period and learn to fly Harts. Hart Trainers and Hart bombers are both used. At the end of this period, as a rule, the pupils do their air firing and bombing courses at the Tentsmuir range, which is only about a mile and a half away from the station. This is a great convenience, for at all the other F.T. Schools the advanced training squadron has to go away *en masse* to an armament training station. So will the pupils of No. 1 F.T.S. after the move to Netheravon, but at Leuchars they have been fortunate in avoiding this move. Tentsmuir will continue to be used as a range after the departure of No. 1 F.T.S. by the Ansons of the general reconnaissance squadrons and the Vildebeests of the T.B. squadrons. In fact there is always one of these squadrons to be found at Leuchars, where they spend a month in turn.

An Osprey, with engine running, being lowered on to the Leuchars catapult. Below, the pilot is seen climbing to his cockpit while a Naval instructor waits to give the launching signal.



These three photographs show three stages in practice landings on a dummy deck marked out on the aerodrome at Leuchars. Though the conditions are not identical with those of landing on a moving carrier the practice is still very useful to the pilots.

When the pupils get to "C" period they again find No. 1 different from all other F.T. schools. They are then divided into two categories (in actual fact they have been so divided before that time), namely, the fleet-fighter pilots and the torpedo-spotter-reconnaisance pilots. The former remain at Leuchars for the final period, and are put through a course of landings on a dummy deck laid out on the aerodrome. But there are no facilities for torpedo practice at Leuchars, so the T.S.R. pilots have to go to Gosport for their "C" period. The types used for the fighter pilots on their "C" course are the Osprey and the Nimrod.

Landings on a dummy deck are not altogether the same thing as landing on the deck of a moving carrier, but the former are useful for teaching the pilots the elements of the job. After finishing their "C" course at Leuchars and Gosport, the pupils go for a cruise in H.M.S. *Furious*, which is now used as a training carrier. After that cruise they are fit to be posted to a carrier with one of the fleets.

In the course of their training at Leuchars the pupils do a number of launches from the catapult erected on the aerodrome. An Osprey is used for this purpose.

All through the course at Leuchars there is ground instruction as well as flying instruction. In this most hours are given to navigation and armament. The Fleet Air Arm is working towards the ideal of making every pilot a competent navigator, though perhaps not so expert as the navigators who are trained as such at Ford, and who do not hold temporary commissions in the R.A.F. All

The group below shows the flying instructors of No. 1 F.T.S. and also one Naval officer on the instructional staff. Left to right (standing): Flt. Lt. M. B. Hamilton; Flt. Lt. W. R. Farley; Wing Cdr. H. H. Down, A.F.C. (Chief Flying Instructor); Cdr. G. C. Dickins, R.N.; Flt. Lt. J. O. Willis; Flt. Lt. M. H. Kelly; Flt. Lt. M. A. Aylmer; P/O H. Z. Foreman. (Sitting): Flt. Sgt. Ivemey; Flt. Sgt. Hayes; Flt. Sgt. Paddon; Flt. Sgt. Watt; Flt. Sgt. Abercrombie; Flt. Sgt. Kean; Sgt. Lambert; Sgt. Scott.

Instruction in navigation in a classroom being given to Naval ratings.

Naval officers have to know something about navigation as part of their profession, though they are not all specialists even for marine navigation, and aerial navigation requires somewhat different methods. It is possible that it may be arranged in the future for all Naval pilots to go to Ford for a course in navigation. For the rest, the ground instruction is on the same lines as at other F.T. Schools, and for instrument flying much use is made of the useful Link trainer.

At the time of *Flight's* visit to Leuchars, the pupils consisted of thirteen Naval officers, three Royal Marines officers, six Army officers, and twenty Naval ratings. This was the first batch of ratings who had been chosen by the Admiralty for training as pilots. It had been popularly expected that the rating pilots would be petty-officers, but actually none of them yet holds that rank. The Navy wants to train its pilots young, and most petty-officers are above the age limit. These twenty came from various branches of the Navy. Three were leading seamen, two were air gunners, and one was a writer. All were granted the rank of acting leading seaman (if not already substantive in that rank) while under training at the school. Most of them had never been in the air before or had known anything about flying, but all were intensely enthusiastic. The batch came into residence on May 9, and in a fortnight nine of them had been judged fit to make their first solo. The instructors considered them a promising lot, and when they leave the school they should be a good advertisement for the Fleet Air Arm.

After the move to Netheravon, No. 1 F.T.S. will cease to put its pupils through "A" period. This will be done at civil flying schools. The Naval officers and Marines officers will be put through the elementary course at Sywell, and the ratings will be taught at Rochester. The latter will live in Chatham Barracks during that preliminary period. Perhaps extended arrangements will have to be made when the expansion of the F.A.A. really gets under way, as there will be direct-entry short-service Naval officers to be trained, in addition to the normal Service entry.

It will be very interesting to watch the future development of the Fleet Air Arm. *Flight's* only regret is that such future observation will not entail more visits to the charming station of Leuchars.

The first batch of Naval ratings sent by the Admiralty to No. 1 F.T.S. for training as pilots of the Fleet Air Arm. They are here seen grouped in front of a tutor, receiving instruction from a sergeant pilot of the R.A.F. When No. 1 F.T.S. moves from Leuchars to Netheravon all rating pilots will receive their elementary flying training at the Civil School at Rochester, before going to No. 1 F.T.S. for further instruction.

HYDROMATIC

New Hamilton Airscrew Development to be Built by De Havilland's : Quick Feathering

THE De Havilland airscrew works are now being equipped for the large-scale production of the Hamilton Hydromatic full-feathering airscrew which has been released by the American authorities.

The new airscrew has been introduced because performance has reached the point where the range of pitch-adjustment of existing airscrews is barely sufficient. Not only are speed ranges and ceilings increasing, but there is a strong demand for power diving in the military field. All these factors tend to demand a greater pitch range, and whereas the first controllable-pitch airscrews had a range of only four or five degrees, current types are using up to twenty degrees, and projected types will need still more. Moreover, there is a need in certain types of aircraft for a means of stopping the rotation of engines which have failed. Friction brakes acting on the shaft have been tried, but usually their action is comparatively slow. If, however, the pitch angle of the airscrew is rapidly increased to about 87 degrees at the three-quarter radius point, rotation is stopped almost instantly and the resistance of the idle airscrew minimised. The practice of adjusting airscrews to this angle is called "feathering." It is claimed by the Hamilton Company that the difference in the ceiling of a twin-engined machine with one airscrew feathered compared with one in similar conditions having one airscrew braked may be as much as 2,000ft.

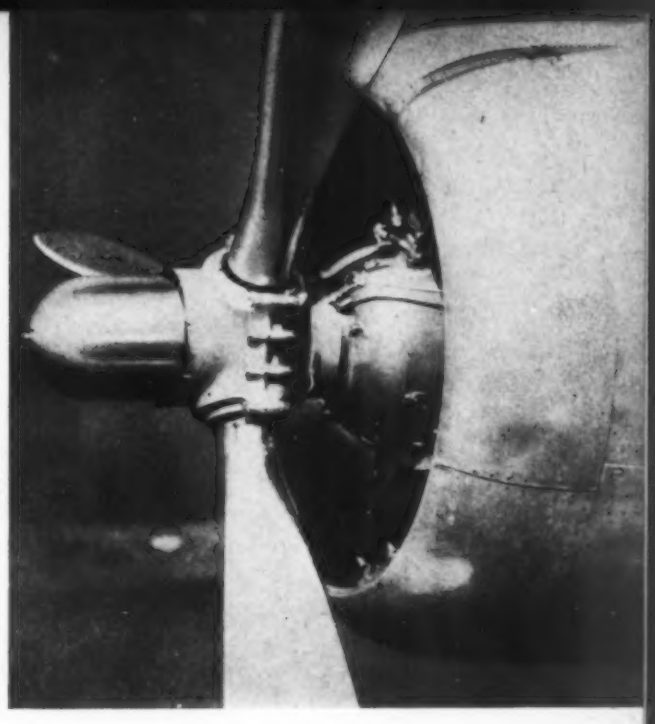
Principles Retained

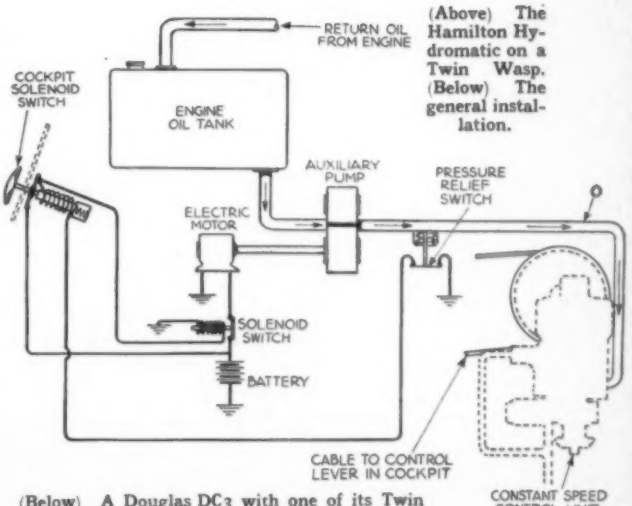
Although the complete mechanism of the airscrew has been redesigned, the change was accomplished without departing from the highly successful hydraulic principle and the proven hub and blade-mounting structure of the older type.

The new airscrew is extensively specified for U.S. Army and Navy aircraft, and both American Airlines and United Airlines are fitting their fleets of Douglas DC3s with Hydromatics as fast as they can be delivered.

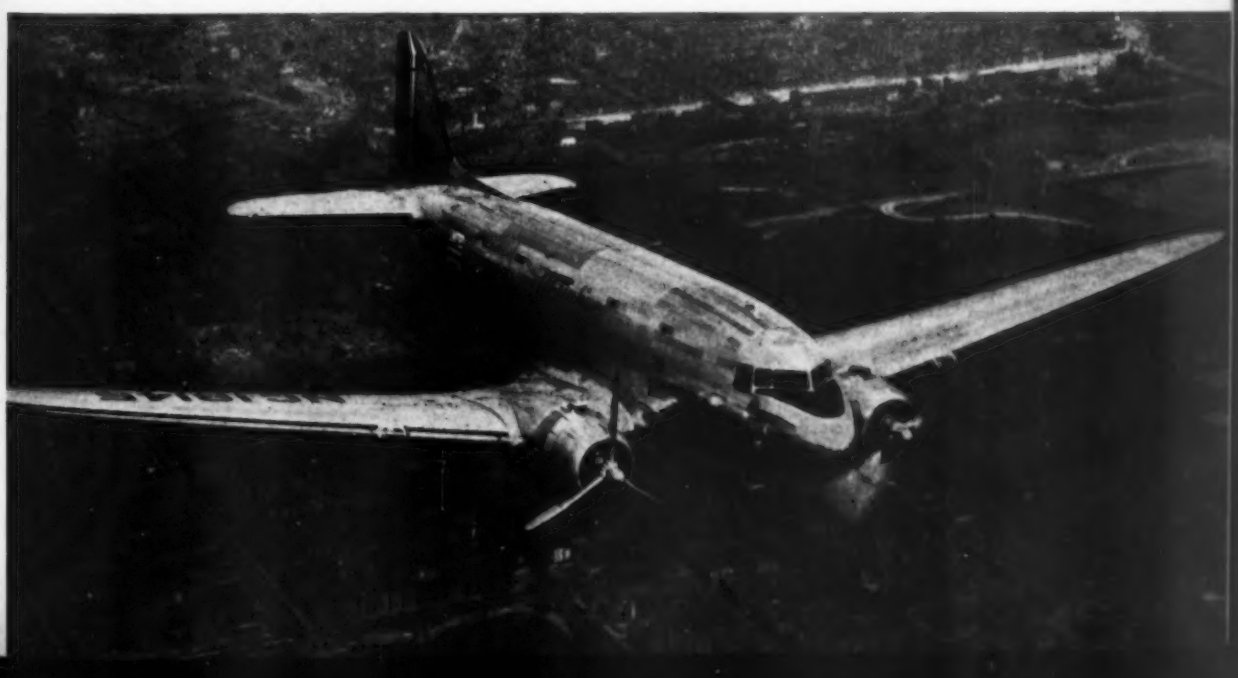
The successful hub and blade mounting structure of the older Hamiltons has been further improved by moulding a collar of plastic material between the roller-bearing race and the fillet of the blade retaining shoulder. This ensures perfect seating of the mating parts, gives a better stress distribution, and protects the aluminium alloy blade from any chafing action, thus increasing its resistance to fatigue. The presence of the plastic layer also permits the use of an effective oil seal between the hub and blade. Such a seal would not be considered safe in direct contact with the blade as it might lead to stress concentration.

It would obviously be dangerous if the airscrews could be feathered inadvertently or through improper functioning of

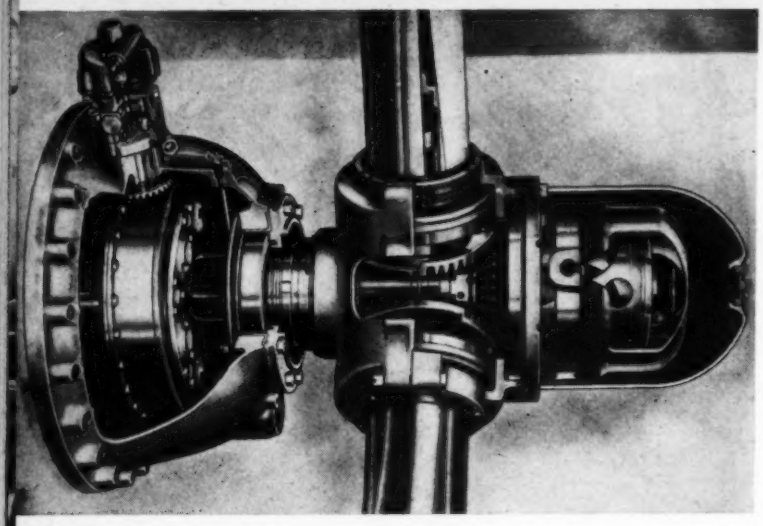


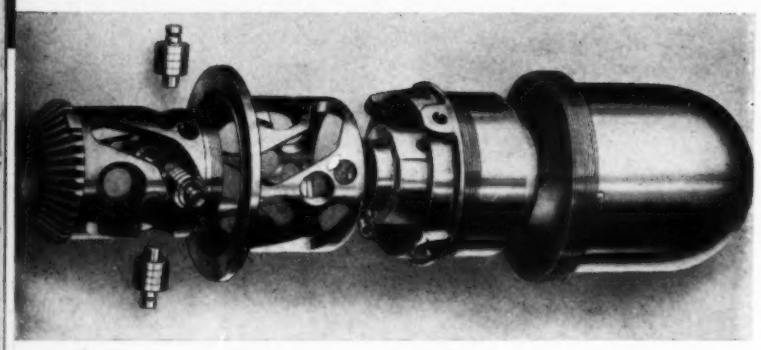


(Above) The Hamilton Hydromatic on a Twin Wasp. (Below) The general installation.



(Below) A Douglas DC3 with one of its Twin Wasps stopped and the Hydromatic airscrew fully feathered.





The photograph on the left shows the Hamilton Hydromatic in part section, while below it is an "exploded" view of the central assembly.

the system. Consequently it is necessary to provide some means of restricting the pitch range during normal operation so that the blades cannot be feathered except by a deliberate action on the part of the pilot. Accordingly, the designer took advantage of the fact that the centrifugal force acting on the blades tends to cause them to go into low pitch. In the Hydromatic design, engine oil which has been boosted to higher pressure by the constant-speed governor pump is used to overcome this centrifugal twisting moment when it is necessary to increase the pitch. This oil pressure acts on a large piston, the motion of which is transformed into rotary movement by means of a series of cam rollers acting on coaxial helical cams of opposite pitch slope. For the normal pitch range the cam follows a steep helical angle so that the piston enjoys a high mechanical advantage. When the pitch reaches the maximum operating value, the slope of the cam becomes flatter so that the mechanical advantage of the piston is insufficient to overcome the centrifugal twisting moments of the blades while normal operating pressures are used. Thus, a maximum pitch limit is provided for the normal flight conditions. If a considerably increased oil pressure is supplied from some other source under the control of the pilot, the piston will overcome the blade twisting moment and the pitch will increase until the feathered setting is reached.

The adjustment toward low pitch is also accomplished by oil pressure, supplementing and augmenting the centrifugal force on the blades. In this case the oil is also engine oil but under normal pressure. This oil pressure is at all times acting on the opposite face of the airscrew piston, and provides a "resilient member" opposing any tendency for a change to higher pitch. Whenever the constant-speed governor valve relieves the higher oil pressure on the other face of the piston, this resilient pressure, together with the centrifugal force on the blades, moves the blades toward low pitch.

To feather the blades an auxiliary pressure supply system is used. A typical example of such a system is shown in the drawing on the opening page of this article. The pump is mounted between the engine oil tank and the constant speed control, and delivers oil under pressure through the pipe-line marked "O" to the cut-out valve built into the base of the constant-speed control. The auxiliary system allows the pump to draw its oil from the engine oil tank; alternative installations have employed either a separate oil tank or have used the hydraulic system of the machine in place of engine oil and the special pump.

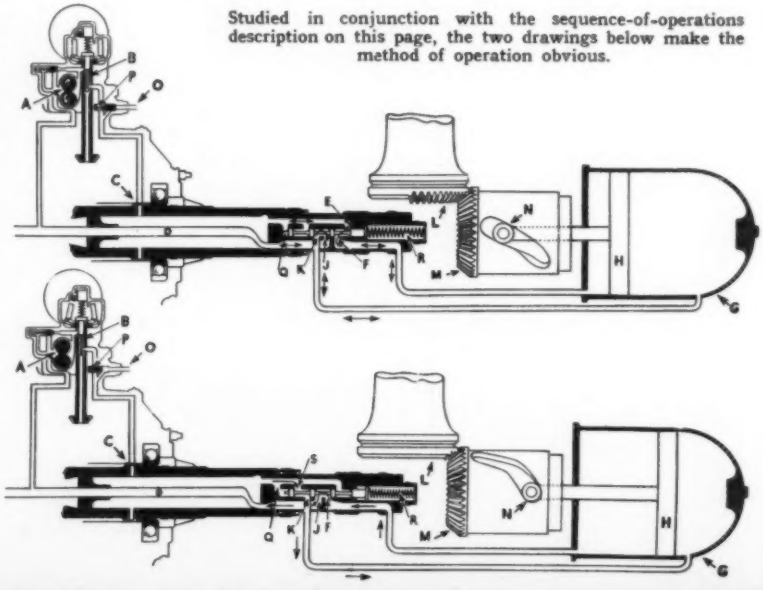
Turning now to the two diagrams on this page, we see that the pump rapidly builds up pressure in the pipe-line already referred to, disconnecting the governor from the airscrew and at the same time opening the pump line to the airscrew by compressing the spring P in the cut-off valve. This feathering oil pressure is transmitted to the rotating airscrew shaft past the oil transfer rings C through port E of the distributor valve assembly and out of port F to the inboard side of the piston H. The piston moves out under this pressure, forcing the engine oil on its outboard side in the dome G, through ports K and J into the oil supply pipe D and back into the lubricating system of the engine. As the piston moves out, the blades move to a higher pitch, the motion finally being stopped by the rotating cam coming up against an adjustable mechanical stop (not illustrated) set for the fully-feathered position of the particular blade concerned.

With all motion stopped and the feathering pump still functioning, the feathering oil pressure builds up until it reaches 400 lb./sq. in., at which point a pressure cut-out switch opens the electrical circuit operating the pump by de-energising the solenoid holding the cockpit solenoid switch in. With the blades feathered, engine rotation is stopped, and consequently the blade centrifugal twisting moment and engine-oil pressure have dropped to zero, and the blades remain in the feathered position. The entire feathering operation is accomplished in an average time of only 9 sec.

To "un-feather" the blade the pump is again started and permitted to build up a pressure greater than 400lb. per sq. in. by holding closed the cockpit solenoid switch. At about 500-600 lb. per sq. in. pressure the force at Q at the base of the distributor valve in the airscrew is great enough to force the valve out, compressing spring R, and the valve moves toward the position shown in the lower diagram, disconnecting the engine oil system from the dome. The oil from the pump starts to fill up the dome on the outboard side of the piston through ports S and K as the distributor valve moves out, and this oil starts pushing the piston in, unfeathering the blades. The oil on the inboard side of the piston is, of course, forced out through ports F and J into the engine oil system.

An unfeathered airscrew being moved through the air will start to windmill. When the engine reaches a reasonable r.p.m. the cockpit solenoid switch is released. The airscrew continues to windmill, cranking the engine, and it is thus possible to start the latter again. The moment the feathering pump stops, the spring in the cut-out valve in the governor

Studied in conjunction with the sequence-of-operations description on this page, the two drawings below make the method of operation obvious.



disconnects the feathering pump line from the airscrew and places the governor back into the system, and the airscrew runs again at the speed for which the governor is set by the pilot in the cockpit.

For normal constant-speed operation the Hydromatic airscrew requires two simultaneous sources of oil supply; one from the constant-speed control booster pump and the other oil under normal pressure from the engine oil system. Referring again to the sequence diagrams, oil from the constant-speed control pump A is permitted to enter the hollow drive gear shaft B of the governor and thence is taken to the airscrew shaft when the engine is turning faster than the speed for which the governor is set by the pilot in the cockpit. Governor oil is thus metered at the top port of the drive gear shaft, and enters the rotating airscrew shaft by means of the oil transfer rings C. It then follows the same path described above, for the oil during the feathering operation, to the inboard side of the piston. At the same time, oil from the engine lubricating system under normal engine-oil pressure enters the airscrew mechanism through the supply pipe D in the centre of the airscrew shaft, and reaches the outboard side of the piston through ports J and K.

The governor oil pressure builds up until it exerts a force greater than the sum of forces which oppose motion of the piston outward into the front of the dome. These forces are: (1) Engine oil pressure times the effective piston area; (2) the net blade twisting force consisting of the blade centrifugal twisting moment modified by the aerodynamic twisting moment; (3) friction of the moving parts of the airscrew mechanism.

The net blade twisting force is transmitted from the blade gear segment L to the rotating cam M, and through the cam rollers N acting in the slots of the rotating cam, to the piston.

The blade centrifugal twisting moment is a moment acting on the airscrew blade around its longitudinal axis in the direction of a decrease of blade angle. It is the result of a force couple consisting of the resultants of components of centrifugal force acting on the mass of the airscrew blade on either side of the blade's longitudinal axis. The aerodynamic twisting moment is usually opposite in direction to the blade centrifugal twisting moment being caused by the position of the resultant centre of pressure of the aerofoil section of the blade in front of the centre of rotation of the blade (the blade's longitudinal axis). In normal level flight this aerodynamic moment is relatively small. When the governor oil pressure builds up to a force on the piston just greater than the sum of these three forces the piston starts to move out toward the front of the dome, and engine oil in front of the piston is displaced back into the engine lubricating system. This outward movement of the rotating cam increases the pitch of the blades and the engine speed is this reduced. As the engine slows down to the speed for which the constant speed control is set, the pilot valve in the governor descends to the position shown in the top view of the governor, thereby shutting off the top port of the drive gear shaft and cutting off the supply of governor oil from the booster pump to the airscrew. The oil under pressure from this pump, of course, then goes through the relief valve back to the engine.

Should the engine r.p.m. fall below the speed for which the governor is set, the pilot valve in the governor descends still further, opening the bottom of the drive gear shaft to drain. Engine oil in the dome at the outboard side of the piston is always, during normal airscrew operation, under pressure from the action of the engine oil pump. This pressure acts as if a spring were placed between the outer end of the piston and the front of the dome, the spring, however, having the unusual characteristic of exerting a constant force regardless of the amount of its compression. The blade centrifugal twisting moment, aided by this "spring" force, moves the piston inward overcoming friction and the back pressure existing in pushing governor oil back through the governor to drain. As the pitch of the blades thus decreases, the engine speed picks up and the pilot valve in the governor is raised, closing off the drain through the drive gear shaft just as the engine reaches the speed for which the governor is set.

The relief valve in the governor is so interconnected with the engine oil system that the valve is held closed by the force of its spring plus the engine-oil pressure. Thus the effect is to provide a maximum pressure differential across the airscrew piston equal to the setting of the relief valve spring and the effect of variations in engine-oil pressure in any one engine or between engine types are eliminated.

More than 500 hours of ground testing have been completed with Hydromatic airscrews, and more than 4,000 hours of test flying have been logged.

£1,500,000 Extension at Bristol

AN important announcement was made by the Air Ministry last Monday about the establishment of further "expansion" factories.

One is the carburettor "shadow" factory, to be operated at Coventry by the Standard Motor Co., Ltd., and already referred to in *Flight*. The other is the first of a new series of extensions to existing factories, for which Government assistance will be given. The works of the Bristol Aeroplane Company will be the first to be expanded under this scheme, and £1,500,000 extensions are being put in hand immediately.

Death of a Pioneer Pilot

FLIGHT records with very sincere regret the death of one of Denmark's earliest pilots, Robert Svendsen. Mr. Svendsen, with some friends, was rowing out to a yacht off Copenhagen; the boat capsized, and he was drowned.

Robert Svendsen, who was 53, bought a Voisin biplane and, in 1910, succeeded in flying across the Sound from Denmark to Sweden. Afterwards he gave demonstration flights in various Danish provincial towns and was also the first man to fly across the Lim Fjord at Aalborg. Two of his contemporaries, Alfred Nervö and Ulrich Birch, have also passed away, Nervö through illness and Birch in an accident on a Maurice Farman before the war. Unlike many of the early pilots, Robert Svendsen soon abandoned flying and took to the much more prosaic livelihood of manufacturing stoves. He can probably be regarded as having been Denmark's pilot No. 1, although Mr. Eilehammer, who is still alive and is an engineer and not a pilot, is reported to have made a flight of sorts long before Svendsen went to France to learn the art there.

Courageous, but . . .

IN odd contrast to Howard Hughes' carefully planned flight with three companions was last Monday's unheralded solo Atlantic crossing from New York to Baldonnel (Dublin) by Douglas Corrigan, flying an eight-year-old Curtiss Robin high-wing monoplane (165 h.p. Wright Whirlwind five-cylinder radial). Corrigan took 28 hr. 13 min.—4 hr. 17 min. less than Col. Lindbergh.

Theory and Practice

"'Flight' Handbook," by W. O. Manning, F.R.Ae.S., and the technical staff of "Flight"; 3s. 6d. (by post, 3s. 9d.). Dorset House, Stamford Street, London, S.E.1.

HERE is a book which will satisfy the requirements of everyone seeking a grounding in the broad principles of flight and wanting to acquire elementary knowledge of modern aircraft design and construction.

To give a brief outline of the contents, the book starts with an explanation of the broad principles of flight, without resort to mathematics, and goes on to discuss the differences between monoplanes, biplanes, tractors, pushers, landplanes, flying boats, etc.

Having thus sketched in a basis, Mr. Manning proceeds to examine in some detail—still virtually without mathematics and with the aid of simple diagrams—the reasons why wings lift and controls operate, going on from that to deal with such matters as skin friction and reduction of drag.

Next he explains modern structural methods, and then reviews various components such as airscrews, undercarriages, braking systems and controls. Another section is devoted to engines and their methods of installation, while a particularly informative one explains the working of instruments. Other chapters are concerned with gliders and their operation, balloons and airships.

Outstanding among the illustrations are some of Max Millar's notable cut-away drawings of modern aircraft.

Saro Scholastic Successes

IN the recent A.F.R.Ae.S. examinations three junior members of the Saunders-Roe staff were successful. One achieved the distinction of three first places, and is the first to receive the recently founded Major Baden-Powell Memorial Prize.

Also, in the April examinations for the National Certificate in Engineering, ten of the firm's apprentices were awarded certificates in aeronautical engineering.

Saunders-Roe have in operation an apprentices' technical training scheme, consisting of part-time day courses in aeronautical engineering, conducted in the firm's school, and co-ordinated with evening courses at Cowes Evening Institute.

COMMERCIAL AVIATION

IN ECUADOR: A Junkers Ju. 34 (540 h.p. B.M.W. Hornet) and (nearest camera) Messerschmitt Taifun, of Sedata, Ecuador's airline. It is seen on Quito Aerodrome, which is surrounded by mountains, and difficult to approach in bad weather (the company was recently unlucky enough to lose its founder, Herr Fritz Hammer, when the clouds closed down on a machine which he was flying out of Quito). In spite of such difficulties, the line gives valuable service, notably by reducing the time from Quito to Guayaquil to 1½ hours as compared with a two-day train journey.

THE WEEK AT CROYDON

"A. Viator's" Causerie on Airline Affairs at London's Main Terminal and Elsewhere

LUTON Aerodrome, opened last Saturday by Sir Kingsley Wood, is a fine place, and should make an excellent emergency airport for Croydon. I understand it is fairly fog-free and there is plenty of landing space, and will be more later on, for there is ample room for enlargement.

I saw a lot of commercial airline people there, and I believe that almost every firm was represented. Airline managers watched the Mayo composite come unstuck and were considerably impressed. It also interested them quite a bit to see the Albatross, which has remarkably fine lines and looks nice in the air.

It would be much pleasanter to land at Luton and get a train to London than to hang around in the skies for fifty or sixty minutes in QBI, "your turn being number five" and weather deteriorating.

Wrightways is a firm which quietly goes about its business and makes very little song-and-dance about it. The company has just flown a million miles in three years with five machines, now two D.H. 86s and three Rapides. A novel scheme on the Wrightways early morning business man's machine to Paris is the provision, on arrival, of a shave, bath and breakfast at a Paris hotel. These blessings are included in the fare and just fill in time nicely, for the machine leaves Croydon at 5.30 a.m., reaches Paris at 7.30. Bathed, shaven and refuelled, the business man who uses this service emerges from his hotel at about 9 a.m. ready to drive astonishing bargains.

H.H. the Maharaja of Jaipur has a "minority" question in his State, and in order to be on the spot with all speed he left Croydon for India last Wednesday. He was home in three days.

Capt. Fritz Wiedemann, personal A.D.C. to Herr Hitler, arrived at Croydon quite quietly on Saturday night from Berlin, and on the previous day Herr Albert Foerster, leader of the Nazi party in Danzig, left Croydon by D.L.H. for Berlin.

A fifteen-foot snake also travelled by air to Croydon during the week. It is not known whether the snake was packed in a coil like rubber hose or stretched out flat in a fifteen-foot box. Anyway, the parcel was not opened for Customs examination.

The K.L.M. Lockheed 14 now in regular use on the Liverpool-Manchester-Amsterdam line made a fast flight recently (without the usual fierce following wind) by covering the 335 miles in 1 hr. 35 min.

Fresh river trout, caught at 6 a.m. one morning last week in the Jura Mountains, were served at luncheon at a London hotel the same day. The affair was organised by Air Express, Ltd., of Croydon, the idea being to show in a practical and pleasant manner the advantage of air transport for hitherto unprocurable foreign delicacies.

The idea might be extended to a dinner of which each course (starting, for example, with Italian salami and Scandinavian smoked reindeer meat) would be the speciality of some European country within an easy day's flying of London. The dinner might end on a genial note with French coffee, and liqueurs from Holland.

This idea is offered gratis, but an invitation to the dinner, when and if arranged, would be promptly answered in the affirmative.

Premature

THE *Lieutenant de Vaisseau Paris*, Air-France Transatlantique's Latécoère 521 flying boat, has flown to the transatlantic base at Foynes from the Etang de Berre, Marseilles. This gave rise to rumours that the French were planning a North Atlantic flight from Foynes with the ten-year-old boat.

The trip, however, was merely a visit to enable important French officials to meet the authorities at Foynes and it served as a variant to trips between Biscarosse and Berre which the *Lieutenant* has been making to run-in the six new Hispanos recently fitted. Her series of projected Atlantic flights this year will be via Lisbon and the Azores, and the pilot in charge will be Guillaumet, who was not in the crew which flew to Ireland. These flights are due to start after August 10.

COMMERCIAL AVIATION (CONTINUED) : WORLD NEWS

Russian Reopening

LAST Monday the Moscow Air Express, which was operated intermittently and experimentally during last season, was reopened. This service, which permits a two-day connection from London, is flown jointly between Stockholm, Riga, Velikije, Luki and Moscow by A.B. Aero-transport and Aeroflot on weekdays in each direction. A.B.A. are using Junkers Ju 52s and Aeroflot are using a Douglas D.C.3. The service will run until October 15.

Holland's New Civil Airport

SOME weeks ago we published an unconfirmed report to the effect that, much to the Amsterdam Municipality's annoyance, the Netherlands Government was to take over Schiphol and to lay out a new civil aerodrome.

It appears that the plans for the new airport are, in fact, going through at a cost of about £1,700,000. The reasons are given as strategic. The new airport will lie within a few miles of the town of Leyden.

An Italian Disaster

ON July 14 an Ala Littoria flying-boat on the Rome-Sardinia service was lost about ninety miles from the Sardinian coast. In all twenty persons, including the crew of four, lost their lives, among the passengers being two sisters and a niece of General Valle, the Italian Under-Secretary of State for Air. The machine left Cagliari at 7.30 a.m. in the ordinary way, and the only present clue to the cause of the accident is that there was a heavy mist over the sea in the particular area at the time. The wreckage has, however, been recovered.

K.L.M. Too

MR. A. PLESMAN, the managing director of K.L.M., paid special tribute to the work of Imperial Airways and Qantas Empire Airways in a little speech which he made at the party given last Friday evening at the Dorchester to celebrate the arrival of the first Netherlands service from Australia.

He also looked rather far into the future and said that the present eight-day schedule of K.L.M. and K.N.I.L.M. would, in three years' time, be reduced to three days—which, he explained, would be no more remarkable a reduction of travelling time than that which has been made during the last three years. If the present fleet used were flown continuously night and day this three-day schedule could even now be maintained. The machines, however, were not arranged with night accommodation for passengers and they would have to wait for larger machines (presumably the D.C.4 or big Boeing), with pressure cabins for high-altitude flying, before the three-day schedule could become a regular one. At present, also, not all the airports on the route were suitably equipped.

Speaking of the British and Australian companies, Mr. Plesman said that they looked forward to a great future under the guidance of Sir John Reith and Mr. Hudson Fysh, and spoke of the all-up Air Mail Scheme as a colossal undertaking.

At the Dorchester party the guests were given copies of Australian newspapers with illustrations both of the arrival of the first Empire boat through service at Sydney and its departure from Southampton—the latter taken out by K.L.M.! H.E. the Netherlands Minister was there to receive important Australian guests.

The Imperial Ballot

REPLYING to questions in the House last week, Capt. Balfour said that the results of the ballot taken by the Imperial Airways staff concerning the representation to be used showed a preference on the part of both the captains and the first officers for representation by the British Air Line Pilots Association.

Among the captains twenty-one voted for a domestic committee and thirty-eight for B.A.L.P.A., while the first officers' section figures were ninety-one in favour of B.A.L.P.A. and four in favour of a domestic committee.

Automatic Position-finding

AN American transport pilot, Mr. H. Stark, who was responsible for the previously described airport orientator, has developed a position-finder, for use with radio beacons, which is of suitable size for convenient use by a pilot in the air. This instrument, which superficially resembles the old type of C.D.C., has three movable transparent discs in the frame, the uppermost disc carrying a replacement map showing the position of the different beacons. This map is orientated to the compass course being flown and bearings from two beacons or broadcast stations are then transferred to the other discs, which are marked with parallel lines, to give an intersection position which, it is claimed, is within five miles of the true one.

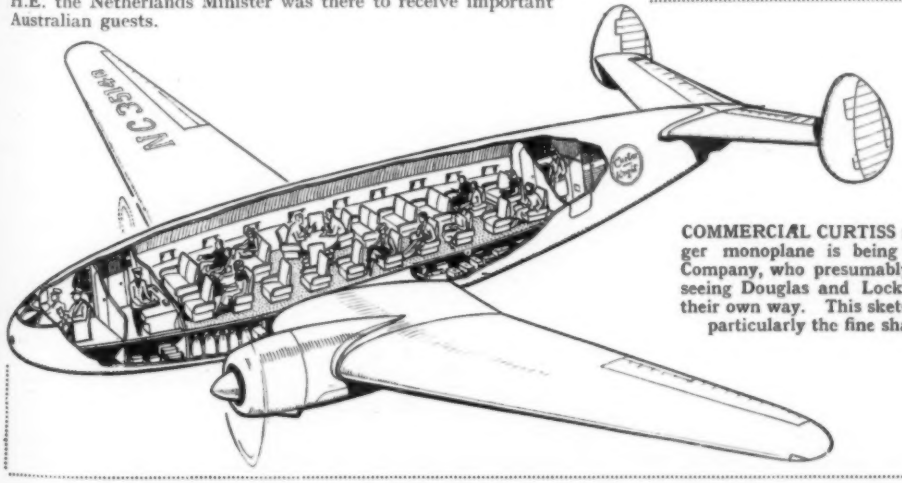
Such an instrument in a simplified form should be useful to European transport pilots now that the authorities are going ahead with the idea of providing permanently operated omni-directional beacons working on the same frequency. The first three to go into action are those at Mitcham, Schiphol and Le Bourget.

Composite Test

AFTER a fuel consumption test flight of 2,040 miles last Thursday between Southampton and Foynes, out over the Atlantic, and over the South of England, *Mercury*, the upper unit of the Short-Mayo composite, returned to Southampton after being in the air for nearly twelve hours. The separation was made some time after 7 a.m. and the pilot, Capt. D. C. T. Bennett, who will make the first Atlantic flight in the machine, was accompanied by an Air Ministry observer and by the radio operator, Mr. A. J. Coster, who will be with him on the Atlantic flight. Tests, mainly on short-wave, were made with the Foynes station and with that at Botwood, Newfoundland, while the machine was out over the Atlantic.

Weather permitting, the machine was due to make the Atlantic crossing during last night and to-day (Thursday), and she was expected to be carrying half-a-ton of genuine freight in the way of news reels, photographs and papers.

Incidentally, the engines which were substituted a few weeks ago for the Napier Rapier Vs in *Mercury* are of the series VI type, which are moderately, instead of fully, supercharged. The series VI engine is rated at 355/370 h.p. at 3,500 r.p.m. and 4,750ft., the maximum output being 380/395 h.p. at 4,000 r.p.m. and 6,000ft. Performance at moderate altitudes should be very considerably improved.



COMMERCIAL CURTISS : A new thirty-passenger monoplane is being built by the Curtiss Company, who presumably have had enough of seeing Douglas and Lockheed have everything their own way. This sketch shows the lay-out, particularly the fine shape of the fuselage.

Commercial Aviation

A YEAR in RETROSPECT

Airline Operations and the Civil Aviation Report

ALTHOUGH it is easy enough to complain of the appearance, in July, 1938, of a report dealing with civil aviation for 1937, it must be admitted that the Air Ministry's Annual Report makes reading which is more interesting year by year. This time the Report is made in two separate publications, the first following the older style, but without the extensive appendices, which are being published in much more detailed form as a statistical review for the use of the more earnest students of aviation.

The introduction of the Report emphasises the fact that civil aviation is still flying by itself only in isolated instances and that it has more recently assumed a national importance which demands special attention. Our own contribution to the new ideal (if so it can be called) in air transport is the Empire Air Mail Scheme. At home the Government's policy has been largely guided by the recommendations of the Gorell Committee in 1935 and of the Maybury Committee in 1936. Since the Report deals only with 1937, the findings of the more recent Cadman Committee do not come seriously into the picture. Most interesting of the general remarks in the Report is the statement of the increase in aircraft, passenger, freight, and, more particularly, mail ton-miles on the various regular services operated by British interests. The figure for mail, for instance, increased from 1,895,400 ton-miles in 1936 to 3,871,900 in 1937.

Quite a number of references are made to projects about which little or nothing has been previously said. For instance, during this year it is proposed that British Airways shall start a London-Lisbon service as a step towards the establishment of that to West Africa and South America. Surveys have been made of many islands between Honolulu and Fiji for possible use as air bases when the Canada-New Zealand service is established and a Government Administrative Officer was in residence at Christmas Island early this year.

In the important world of radio services the Report explains that the long-range "track" type of medium-wave radio beacon, such as is used in the U.S., may be ruled out of consideration so far as Europe is concerned; that the omni-directional beacon such as that installed at Mitcham retains all the former's advantages in providing a relief for traffic congestion, while covering a greater service area with one wave-length; that a third beacon, of the rotating type, might be useful for the crew of small machines unable to carry their own direction-finders. In dealing with what is known over here as the V.H.F. blind approach system, the Report adds that the problem of providing completely blind landing still remains to be solved and suggests that the use of even shorter waves, possibly 2-3 m., might permit a more accurate vertical glide path than is at present obtainable. The staff of the R.A.E. is hard at work on the various problems concerned with direction-finding and blind-approach.

In the section dealing with aircraft development the Report comments favourably on the tricycle undercarriage, on the constant-speed airscrew, and on the valuable use of plastics in aircraft structure, though in the latter case it is suggested that the large cost of dies is a deterrent to progress, and even if a sufficiently large number of aeroplanes are ever required to make this cost a proportionately reasonable one, the advantage will probably remain with metal construction for some time to come.

THE EMPIRE AIR MAIL SCHEME

In Defence of the Payments

THERE seems to be an impression among the general public that the Empire air mail scheme is costly. This impression has spread recently, doubtless because of the reference to high subsidies in the Cadman Report. It is only fair to the Government and Imperial Airways to correct these quite inaccurate surmises.

The total annual cost is £1,500,000; this is quite a lot of money. Put in another way, that each letter flown under the scheme costs 2½d., of which 1½d. is paid by the sender and 1d. by the Government, the cost does not appear to be excessive!

This cost of 2½d. per letter can be substantiated by figures given by Lt. Col. Burchall during a lecture given to the R.U.S.I. early this year. These figures do not appear to have been given the publicity they deserve; perhaps the writer may be permitted to quote in full the portion of the paper relating to the subject of subsidy:—

"The White Paper, Cmd.5414, which outlined the Empire Air Mail programme, shows that the average annual payments made to Imperial Airways for the 15-year period are: (a) Postal payment of £900,000 per annum; (b) subsidy contributions, average £600,000 per annum.

"The weight of mails outwards from the United Kingdom above which the Postmaster-General has agreed to make additional payments to the company is shown as 1,250 tons during the first seven years and 1,500 tons during the remaining eight years of the scheme. The 1,250 tons may therefore be taken to be the weight the company is to carry for the payment in (a) above.

"The inward mails are not stated in the White Paper, but we assume that they will be in the region of 720 tons. This gives a total of inward and outward mails of about 2,000 tons per annum to be carried during the first seven years. The average length of haul on the England-Australia and England-Durban routes is probably about 6,500 miles, so that for 2,000 tons per annum the annual mail ton mileage would be 13,000,000 for the first seven years. For the next eight years the tonnages increase by 20 per cent. and the ton mileage will probably increase in proportion, so that in round figures it seems that the average mail ton mileage which the company has to carry annually during the 15 years is 15,000,000.

"As the total mail and subsidy payments are an average of £1,500,000, the rate of payment is 2s. per ton mile, which is paid as to three-fifths or 1s. 2.4d. by the Post Office and two-fifths or 9.6d. by the Air Ministry.

"An examination of the company's fare schedules shows that the fare to Calcutta is £108 for 6,400 miles. Taking ten passengers to the ton, this gives a rate of about 3s. 5d. per ton mile. The fare to Singapore is £156 for 8,400 miles, which is also equivalent to about 3s. 9d. per ton mile. The fare to Kisumu is £105 for 4,600 miles, or 4s. 6d. per ton mile.

"The freight rates are considerably lower than those for passengers. The average is roughly about half. On the other hand, the volume of passenger traffic considerably outweighs the quantity of freight, and, allowing for this, the average earnings from all classes of traffic are not much below the normal passenger rate per ton mile. It seems from this that the stigma that attaches to the term 'subsidy' is hardly justified in regard to any part of the payments which the company receives from the Government under the Empire Air Mail Agreement. If the payments for the carriage of mails were made at only about two-thirds of the company's average rate of earnings the question of subsidy would not arise at all. It therefore seems fair to regard the *total* payments referred to in the White Paper for the Empire Air Mail scheme as being payments for the actual carriage undertaken."

Now, £1,500,000 divided by 2,000 equals £750 per ton; 71,680 ½ oz. letters equal 1 ton. If the writer's arithmetic is not at fault this equals 2½d. per letter.

Is there any other airline in the world in a position to carry out a similar contract?

W. L. NAYLOR.

Forthcoming Events

July 17-24. Third Littorio Rally, Italy.
July 23. County Flying Club: Flying Meeting at Rearsby, Leicester.
July 29-August 1. Courtrai Rally, Belgium.
July 30. Official opening of Exeter Airport by Secretary of State for Air.
July 30. Folkestone Aero Trophy Race, Lympne.
August 20. Eastbourne Flying Club: Garden Party and Opening of New Club-house.
August 27-28. Southend Flying Club: Flying Meeting and Race.
September 3. Cinque Ports Wakefield Cup Race, Lympne.
September 10. Cardiff Aeroplane Club: London-Cardiff Race.
September 11-18. Swedish Civil Aviation Week.
September 21. Aero Golfing Society: Cellon Trophy, Richmond Golf Club.
November 18-December 4. Paris Aero Show.

TOWARDS the FLYING SHIP

Details of the Boeing 314 or Atlantic Clipper : A 100-passenger Successor?

The Boeing 314 taking off from Puget Sound. Twin rudders and redesigned sponsons are being fitted as the result of initial tests.

SOME illuminating facts have lately been disclosed by the Boeing concern relative to the Model 314, or Atlantic Clipper, flying boat. The machine is now being modified after initial tests.

Among the many practical benefits conferred by the exceptional size of the machine is the accessibility of its four 1,500 h.p. two-row Cyclone 14s. during flight. Catwalks in the leading engine of the wing lead to the semi-monocoque engine nacelles, each of which is circular in section and roomy enough for several men to work erect. This feature was first introduced on the Boeing XB-15 experimental bomber for the U.S. Army Air Corps. The Hamilton Hydromatic full-feathering airscrews enable any of the engines to be stopped during flight so that mechanics may work on engine accessories *en route*. Doors on either side of each nacelle fold down to form maintenance platforms.

The control deck provides ample working space for the flight crew of six. The main control room measures 21ft. by 12½ft. At the forward end are the pilot's and co-pilot's positions, which have surprisingly few controls and instruments because of the decentralisation of duties. On the port side, behind the first pilot, is the navigator's position with a table 7ft. long and 2½ft. wide for laying out full-size nautical charts. Opposite the navigator, on the starboard side, is the wireless operator's desk. The equipment includes a direction-finder, three transmitters and four receivers.

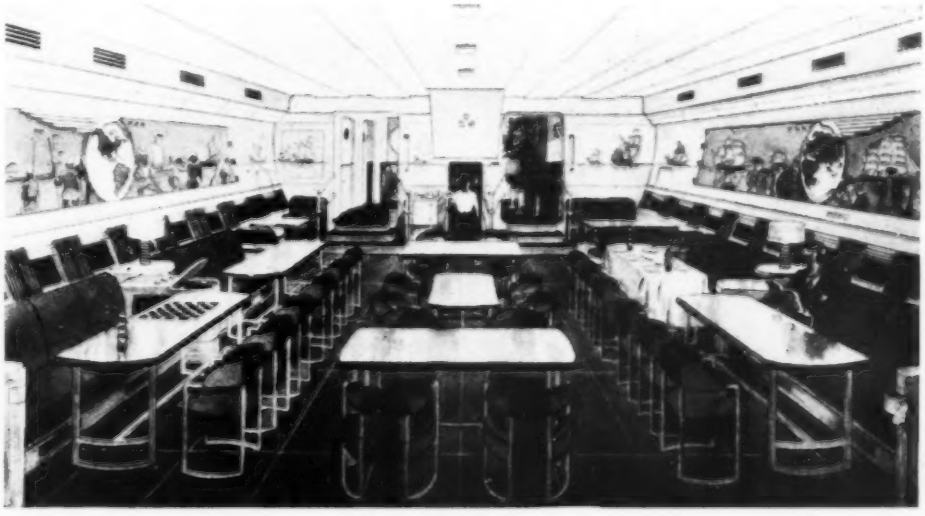
Behind the navigator is the captain's desk and overstuffed chair, with a second chair alongside for conferences. Although hitherto the captain of an aircraft has been the first pilot, the 314 has a separate office for the captain to supervise and co-ordinate the work of the other members of the crew.

Opposite the captain's desk are the flight engineer's quarters, with a desk and expansive instrument and control panel. The engineer is in charge of the fuel valves, mixture controls (being aided by an exhaust gas analyser), pitch controls, temperature controls, and individual throttles for the engines. Special instruments and synchronisers are fitted to co-ordinate engine speed. Opposite each side of the engineer's station are doorways to the catwalk, which lead out through the wings to the nacelles. The control room is soundproof throughout so that the crew can confer without the aid of telephones.

Behind the main control room are the cargo rooms in the centre of the wing; they are divided with different compartments for mail, baggage and freight. Above the centre aisle in this section is a large loading hatch fitted with a glass-enclosed turret for celestial observations. On each side of the cargo sections is a 600-gallon fuel tank. The main tanks are in the sea-wings, or sponsons. The passengers' lounge and dining room are in the same region, on the main deck below. Thus all the weight variables—cargo, fuel and passengers—are located near the centre of gravity. Behind the cargo rooms on the top deck are the crew's sleeping quarters.

Steps from the control room lead down to the mooring compartment in the bows, which contains an 80 lb. stainless steel anchor, additional sleeping accommodation for the crew, and the further cargo space.

The passenger deck is divided into nine separate sections. Five of these are standard passenger compartments accommodating ten passengers each; the sixth is a small compartment



A SUPER, SUPER-CLIPPER: The interior of the 100-passenger transoceanic flying boat planned by the Boeing Aircraft Company for Pan-American Airways. The machine, if ordered, would resemble a scaled-up 314 with six engines built into the wing, a hull of improved aerodynamic form and retractable wing floats.

Commercial Aviation

for four passengers. In the centre is a large room which may be furnished as a lounge or dining room. The rearmost section is a de luxe compartment which, according to the sentimental compiler of the Boeing specification, may be used as a bridal suite. The galley and men's dressing rooms are across the hall from each other near the forward end of the passenger deck; the women's room is at the back.

The ten-passenger compartments have Davenport seats. Two of these are triple seats facing each other on the starboard side, and the other two are double seats facing each other on the port side. The triple seats each make up into upper and lower berths running crossways in the cabin, while the two double seats make up into an upper and lower berth running lengthwise on the port side. The berths are 6ft. 3in. long and 32in. wide and give 35in. head room.

The de luxe compartment has a triple seat (Davenport type convertible into upper and lower berth) built-in settee, dressing table or desk, two end tables, glass mirrors, washstand and cabinet, and an overstuffed chair.

The dining room, which accommodates fourteen persons at a time, has modern tables between casually arranged overstuffed chairs. When used as a lounge, without dining tables, it is furnished with seats for fourteen people, convertible into berths. Between meals the galley may become a bar.

Nor does the Clipper lack interest on the structural side. The wing has two main girder-type spars and a stressed skin covering consisting of aluminium alloy corrugations on the inside and smooth Alclad aluminium alloy sheet on the outside. The fuel tanks are built integrally with the sponsons, the outside skin of which serves also as a wall of the fuel tank.

A shipyard method, using full-scale metal templates (drawings on white-coated aluminium sheets, taken directly from the "loft" where hull contour lines were laid out full size) serves to supplement or replace blue prints.

Another innovation is the extensive use of electric spot-welding for joints in places which are not highly stressed. For instance, the Alclad sheets for the wing were joined by this process before being riveted to the wing structure.

The Boeing 314 weighs 82,500 lb., and has a span of 152ft. Length and height are 109ft. and 28½ft. respectively. Seventy-four passengers are accommodated in the daytime and forty at night, in addition to the crew of eight. The cargo holds will carry more than 10,000 lb. of mail and freight. With forty passengers the boat has a range of 4,000 miles. The top speed is about 200 m.p.h.

As the outcome of initial tests modifications are being made to the tail (twin rudders have been found desirable) and to the sponsons.

AERODROME OWNERS in CONFERENCE

Association's First Provincial Meeting : Fees and Reserve Rentals Discussed

APART from inevitable and sometimes angry allusions to the question of direct subsidy, the discussions at last week's first provincial conference of the Aerodrome Owners' Association at Brighton revolved for the most part around the standardisation of aerodrome fees and of the business arrangements over Reserve and Volunteer Reserve School accommodation. Thirty-two aerodromes were represented at the Conference, and opinions were as diverse as might be expected, though agreement was reached on the major points at issue.

In his speech at the Royal Pavilion the chairman of the Association, Mr. C. M. Newton, naturally expressed his disappointment at the Government's apparently irrevocable decision that no direct subsidy would be available, and he made it clear that the owners would not consider help through Reserve contracts as in any way taking the place of this subsidy. The aerodromes were not, in fact, being helped so much as helping the Government in this matter, and, in particular, he felt that the Air Ministry should be made to pay a fair rental for the facilities.

Referring to the recent visit of a delegation to Germany with the idea of forming an international organisation, he said that this country had been left to work out the project.

During discussions it was suggested and agreed that immediate steps should be taken to introduce a standard scale of charges for aerodromes to be agreed upon by the Air Ministry and the Association. This scale should, according to one speaker, be incorporated in the Air Navigation Directions and its acceptance and application be made a condition of the issue of an aerodrome licence.

Standard Charges

The Association's suggested fees for landing are worked on a basis of 9d. for each 1,000 lb. of the gross weight of the machine, the minimum charge at any aerodrome being 1s. Load fees will be at the rate of 1s. 6d. for each passenger and an additional 1s. 6d. for each 150 lb. or 4 cubic ft. of goods, apart from the luggage which is normally allowed free for passengers. Night landing charges will be left to the aerodrome owners' discretion. Private machines which are housed under contract at an aerodrome shall have free use of the aerodrome, and forced landings through weather or other cause at the aerodrome from which the particular machine has just departed will not be charged. There will be a rebate for commercial operators using an aerodrome regularly, and the load and landing fees will be reduced in the case of ferry services and pleasure flights. Apparently, practice landings by private aeroplanes will be charged at the usual rate—which is a little hard on the pilot who may not always be aware that he is rapidly increasing an already heavy bill at every touch-down.

A good deal of criticism was voiced at the meeting on the matter of the Air Ministry's methods of arranging for Reserve schools. It was suggested that the Government had played one owner against another in an attempt to bring down the rentals, and in two cases the Air Ministry was reported to have used the acceptance of a certain figure by one municipality in order to encourage another to agree to this figure, whereas, in fact, each had explained its decision to refuse to accommodate the Reserve for reasons of its own. In other cases a rental had been agreed upon and the Air Ministry had then, it was said, increased the number of machines in use. (Since the schools are invariably operated by private companies it did not seem to us that the Air Ministry is to be blamed for any hard business deals which may be made.) It was agreed, however, that the Association should come to an arrangement with the Air Ministry so that the rentals should be standardised according to the number of machines used in each case.

In the evening of the first day of the Conference (July 14) the representatives were the guests of the Mayors of Brighton (Ald. Hone) and Hove (Coun. Hillman), the former taking the chair. While seconding Ald. Hone's toast to the Association, Coun. Hillman referred to the fact that theirs was the first joint airport to be opened in the country, and made reference to the National Air Defence Cadet Corps, a centre for a squadron of which will presently be made at Shoreham airport. In his reply, Mr. Newton, the chairman of the Association, paid a tribute to Ald. Milner Black (the chairman of the airport committee) and Mr. Volk, largely through whose efforts the joint Brighton, Hove and Worthing Airport had come into being.

On the next morning the delegates were shown round Shoreham Airport, where extensions and additions are now being made. Very shortly the Air Ministry will be taking over the control there, and the control room is being extended to accommodate both the new officers and the radio and teleprinter equipment which is being installed. Additionally, night-flying equipment will also be ready before the winter season, and Shoreham aerodrome will then be ready for all comers. Already the amount of flying carried out from Shoreham is being very much increased, and during the last month or two what may be considered as a civil extension of the School of Air Navigation at Manston has been in operation there, three Rapides and a Dragon being used for the practical work by the pupils.

By way of returning hospitality, the Association gave a luncheon on that day, Sir Francis Shelmerdine being the guest of honour. Mr. Newton said, among other things, that he hoped that the Air Ministry would make an attempt to improve the æsthetic appearance of the buildings which they were putting up at different civil aerodromes. Ald. Milner Black said that the joint airport idea was a good one where grouped towns were concerned and, after expounding a system of airport finance which suspiciously resembled the social credit scheme, pointed to Perth as an airport where the municipality had successfully prevented the Air Ministry from ruining the appearance of the airport building. Finally, Sir Francis Shelmerdine, replying for the guests, said that the Air Ministry welcomed the idea of an International Association and hoped that at the next meeting between the Air Ministry and the Association, which would be held on July 29, agreement would be reached on the matter of both fees and Reserve rentals. There is, it seems, reading between the words, just a chance that something may be done by way of assistance for aerodrome owners in a rather more direct manner than that of offering training schools. That remains to be seen, but it does not seem likely that, after all this time, the Government will reverse its constantly reiterated decision against direct subsidisation.

"Flight" photograph.

OXFORD SQUADRON in CAMP

Mixed Weather at Ford

FORD aerodrome has again been the choice of the Oxford University Air Squadron for its annual summer camp. A real camp it is too, as it was last year, instructors and members living under canvas. The members live in bell tents, two sharing a tent, which is amply comfortable for the fortnight that each member spends at Ford. The instructors have to spend the whole six weeks under canvas, and, therefore, need something a bit more spacious where they can settle down and make themselves at home, and so are provided with larger tents. So long as the weather is kind, nothing is more enjoyable than camping out in summer. The aircraft, however, live in the open, and are merely picketed at night.

For the first fortnight of the present attachment the weather was good, and plenty of flying was put in on ten days. One member, in fact, managed to put in forty hours during those ten flying days. The second period was not so good, and on two nights gales blew up. One night the wind reached a strength of over 75 m.p.h., and fears were felt for the safety of the camp. The squadron lorries were all lined up on the windward side to act as a wind-break, and happily all the tents and all the machines came through without a single collapse. The School of Naval Co-operation, which lives permanently on the other side of Ford aerodrome, very kindly lent the squadron some of its vehicles to carry on with while its own transport was thus obliged to stay put.

This year the O.U.A.S. is proud and pleased that both its Chief Instructor, Wing Cdr. F. L. B. Hebbert, and its adjutant, Flt. Lt. H. J. Kirkpatrick, are Oxford men. The flying instructors from the Abingdon Station Flight, under Sqn. Ldr. P. D. Cracroft, A.F.C., are just as keen on the progress of the squadron as if they too were old Oxonians, and the three Flight Sergeant pilots lent as extra flying instructors during the camp may all be trusted to shout lustily for the Dark Blues at Mortlake, Twickenham, or Lord's.

It is pleasing to know that the Air Squadron does make a strong appeal to actual wearers of the coveted Blue. Two of the victorious Eight, three of the equally triumphant Rugger XV, one Soccer Blue, and one swimming Half-Blue are among the members. The cricket season does not accord too well with flying, and, of course, the Summer Eights are also an interruption. So it came about that one rowing Blue had not been able to qualify to fly solo before he arrived at camp; but he soon put that right. On the whole, the Air Squadron appeals most to the rowing and Rugger fraternities. There are also two sons of Judges in the squadron, and the prophets only know how many men of future fame. Two members are entering for the Colonial Civil Service, and some day, perhaps, will win the K.C.M.G. The Dominions are creditably represented by six South Africans, four Australians, and one New Zealander. Seven supernumerary members are attending the camp. This term means men who are applying for permanent commissions in the R.A.F. without being regular members of the squadron.

Sqn. Ldr. Cracroft has definite ideas, and encourages as much individual cross-country flying as possible. He holds that every pilot ought to be able to find his way about the country, and if he flies in a formation and is not the leader he will not learn to depend on his own navigation.

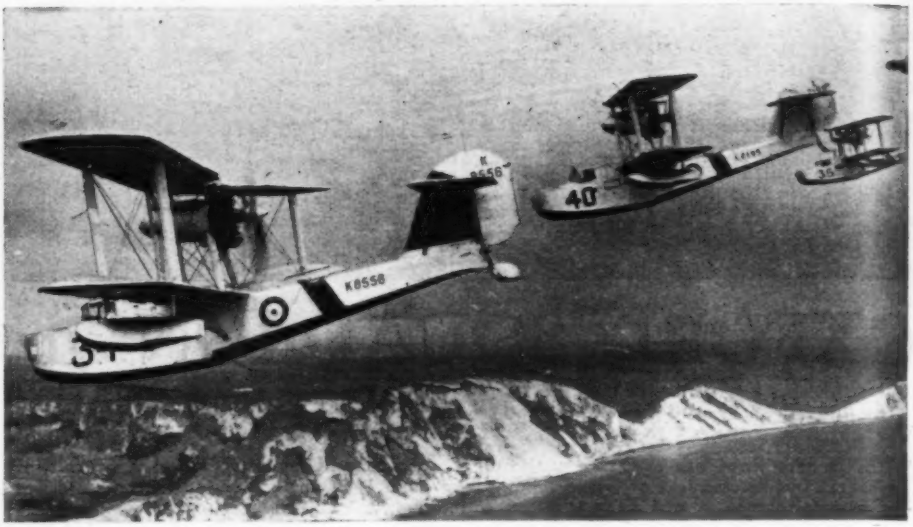
F. A. de V. R.

A group of O.U.A.S. members at Ford. In the centre is the Chief Instructor, Wing Cdr. F. L. B. Hebbert, and on his left is the Adjutant, Flt. Lt. H. J. Kirkpatrick.

"Flight" photograph.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News: Official Announcements: Military Aviation Abroad



PUSHING FORWARD: A formation of Supermarine Walrus amphibian flying boats (Bristol Pegasus VI), carried by the Second Cruiser Squadron.

Home Defence Air Exercise

THE annual Home Defence Exercise of the R.A.F. will be on a more extensive scale than in any previous year. The exercise will take place between 10.00 hours on Friday, August 5, and 09.00 hours on Sunday, August 7. If bad weather conditions cause serious interruption the period may be extended to 09.00 hours on Monday, August 8.

The principal objects of the exercise are to test the air and ground defences of Great Britain against air attack in the area of the exercise and the organisation and efficiency of the various forces taking part.

The area of the exercise will be within the line:—Humber-Dover-South London-Andover-Evesham-Leamington-Rotherham-Humber. Raiders will be presumed to have come from territory situated to the east of this area.

The defending force will consist of 23 fighter squadrons, 14 friendly bomber squadrons, and the ground defences. The Observer Corps will also be employed at strength. The attacking force will have a total of 36 bomber squadrons. Some 900 aircraft will be taking part.

The Home Office is inviting local authorities in the area to arrange for a "black-out" in their districts during part of the night of August 6-7.

Cranwell and Halton Inspections

THE passing-out inspection of flight cadets at the R.A.F. College, Cranwell, will be held on Friday, July 29, and will be conducted by Marshal of the Royal Air Force Sir John Salmond.

The passing-out inspections of aircraft apprentices at the School of Technical Training, Halton, and the Electrical and Wireless School, Cranwell, will be held on July 26 and 27.

The Fleet Air Arm

THE Admiralty announces that new branches of naval personnel will be established to undertake the duties of aircraft maintenance hitherto carried out by personnel of the R.A.F.

There will be three new branches:—(1) Air Artificers, (2) Air Fitters and Air Riggers, and (3) Air Mechanics. The first two branches will ultimately be obtained from Air Apprentices, and will undertake the more highly skilled duties of maintenance. Air mechanics will undertake less highly skilled duties, and this branch will be open to naval ratings now serving.

In the Air Artificer branch the rates of pay will vary from 8s. a day for an Air Artificer 4th Class (Petty Officer) to 12s. 6d. a day for a Chief Air Artificer after six years' service as such. Air Artificers 2nd and 3rd Class will be Chief Petty Officers.

In the Air Fitter and Air Rigger branch the rates of pay will vary from 3s. 9d. a day to 11s. a day, the latter figure being for a Chief Petty Officer Air Fitter (or Air Rigger) after six years' service as such.

In the Air Mechanics branch the rates are from 2s. 6d. a day for an Air Mechanic Probationer (a rating for new entries from the shore) to 11s. a day for C.P.O. Air Mechanic after six years as such.

Uniform, Kit, and Kit Upkeep Allowance.—Naval ratings of the Aircraft Maintenance branches will be dressed as follows:—*Air Artificers*: As other Naval Artificer ratings, *i.e.*, Class III for Petty Officers and Class I for Chief Petty Officers. *Air Fitters and Air Riggers*: As Naval Artisan ratings, *i.e.*, Class III for Petty Officers and Class I for Chief Petty Officers. *Air Mechanics*: As Seaman ratings, *i.e.*, Class II for ratings below the confirmed rating of Petty Officer; Class III with gilt buttons, for confirmed Petty Officers and Class I for Chief Petty Officers. Air mechanics will wear a distinguishing badge, the general design of which will be a two-bladed airscrew, horizontal, with stars, etc., as for the Stoker branch, and the letters (A) or (E) to distinguish specialists in airframes and engines.

A free issue of the necessary kit will be made on joining. An adequate allowance is paid for upkeep of kit. A limited number of airmen below the rank of Flight Sergeant will be permitted by the Air Ministry to transfer to the aircraft maintenance branches of the Royal Navy. Previous experience with the Fleet Air Arm is not necessary.

Malta—A Suggestion

THE following letter has been published in *The Times of Malta*:—"Millions of pounds are being spent on the fortifications of this island especially on the construction of aerodromes, hangars, tanks for the storage of oil fuel, etc. Extensive fertile lands have been levelled up for aeroplanes to land or take off from, but all these places strike me as being extremely vulnerable to air attack. I often wonder why no use is being made by the Air Force of Marsamxett Harbour, which appears to me so suitable as a great seaplane and flying boat base. Those formidable high bastions facing Sliema with the Valletta ditch—which extends from St. Rocco baths to the Grand Harbour—together with the old railway tunnels could easily be converted into a maze of hangars for seaplanes, workshops, food and ammunition stores, storage for oil fuel, etc., etc. These would be quite safe from any air attack, however persistent or severe. Suitable slips could be constructed on the foreshore between the Marsamxett ferries and St. Rocco Baths for seaplanes to be taken in or out of their hangars—dug deep into the solid rock hundreds of feet below Hastings' Gardens. Even emergency barracks or quarters could be constructed in the massive and solid bastions and every single person lodged in them would feel quite safe and comfortable even if the whole of Malta were under the most terrific bombardment. From Marsamxett Harbour, and its various creeks, seaplanes or flying boats can, I believe, easily take off to carry out air raids or join air combats."

Flying Training Schools

THE following officers and airmen have been awarded special assessments on passing out of Flying Training Schools:—

No. 7 F.T.S., PETERBOROUGH

Special Distinction

P/O. G. de L. Harvie.

Distinguished Pass

P/O. P. D. Walker, A.P/O.s P. S. Q. Andersen and R. K. F. Bell-Irving, Sgt. Arnfield, S. J.

No. 9 F.T.S., HULLAVINGTON

Distinguished Pass

P/O.s W. O. C. Hemmings, C. H. Simpson, F. A. Willan, Sgts. Rose, C. F., and Williams, L. C.

No. 4 F.T.S., ABU SUEIR

Distinguished Pass

A.P/O.s C. G. Fisher and J. M. Littler, Sgts. Bailey, H. R., Burke, J. A., Dawson J. W., Eastment, E. P.

No. 5 F.T.S., SEALAND

Distinguished Pass

P/O. A. M. Taylor, A.P/O.s D. Carlson, A. C. Glenday, I. W. Hutcheson, R. W. McCarthy.

Foreign Officers with the R.A.F.

CAPT. AMAL GOKER and Lt. Saim Arman, of the Turkish Air Force, are attending the Long Navigation Course at Manston which commenced on Tuesday, July 5.

Balloon Barrage Squadrons

THE following squadrons formed for recruiting purposes only, on July 5, on which date they were placed in the Fighter Command and in No. 30 (Balloon Barrage) Group: No. 905 (County of Surrey) (Balloon) Squadron, No. 906 (County of Middlesex) (Balloon) Squadron, No. 908 (County of Essex) (Balloon) Squadron, No. 910 (County of Essex) (Balloon) Squadron.

The squadrons will be brought up to full establishment at a date to be decided later, and will be based at Nos. 2, 3 and 4 Balloon Centres at Hook (Surrey), Stanmore (Middlesex), and Chigwell (Essex) after the formation of these stations has taken place. Hook and Chigwell will open on August 4.

Air Council Luncheon

THE Rt. Hon. Sir Kingsley Wood, M.P., Secretary of State for Air, presided at a luncheon given by the Air Council on Monday, 11th inst., at the Savoy Hotel to the Air Attachés and other Members of the Diplomatic Corps concerned with aeronautics.

Royal Air Force Gazette

General Duties Branch

The following Flying Officers are promoted to the rank of Flight Lieutenant (June 15):—E. M. T. Howell, D. H. S. Rusher, F. M. Smith, L. Rose, I. C. Jackson, D. B. Hatfield, H. C. Sawyer.

Lt.-Cdr. J. A. D. Wroughton, R.N., Flt. Lt., R.A.F., is reattached to the R.A.F. as a Flt. Lt., with effect from June 14, and with seniority of July 1, 1935; Cdr. R. St. A. Malleson, A.F.C., R.N., Wing Cdr., R.A.F., ceases to be attached to the R.A.F. on return to Naval duty (June 23); Sqn. Ldr. P. Murgatroyd is placed on the retired list at his own request (July 7).

The following relinquishes his short service commission on appointment to the Air Branch of the Royal Navy on the date stated:—Flt. Lt. A. J. D. Harding (substituted for notification in *Gazette* of April 5) (April 1).

Chaplains Branch

The Rev. D. C. E. Rogers is granted a short service commission with the relative rank of Squadron Leader (June 28).

Royal Air Force Reserve

General Duties Branch

Flt. Lt. T. Joyce-Clarke relinquishes his commission on completion of service (May 1).

The following relinquish their commissions on appointment to the Air Branch of the Royal Navy on the dates stated:—Flt. Lt. J. W. Bateman, Flt. Lt. M. P. Price, Flt. Lt. J. R. Robins (May 30); Flt. Lt. R. L. West (June 7).

Auxiliary Air Force

General Duties Branch

No. 906 (COUNTY OF MIDDLESEX) (BALLOON) SQUADRON.—Maj. E. L. Gower, A.F.C., is granted a commission as Squadron Leader and appointed to the command of the squadron (July 5).

No. 908 (COUNTY OF ESSEX) (BALLOON) SQUADRON.—Capt. P. L. Dyson-Skinner is granted a commission as Squadron Leader and appointed to the command of the squadron (July 5).

Royal Air Force Appointments

General Duties Branch

Wing Commander.—E. F. Turner, A.F.C., to No. 1 (B.) Group, H.Q., Abingdon; for duty as Senior Personnel Staff Officer, 20.6.38.

Squadron Leaders.—C. E. W. Foster, to No. 1 Air Observers School, North Coates; for Administrative duties, 2.7.38. G. R. O'Sullivan, to No. 2 Air Armament School, Eastchurch, 2.7.38. J. C. Stevens, to No. 2 Air Armament School, Eastchurch, 2.7.38. J. R. Scarlett, to H.Q., No. 16 (R.) Group, Lee-on-the-Solent; for Air Staff (Navigation) duties, 19.6.38. W. J. H. Lindley, to R.A.F. Station, Northolt; for Administrative duties, 20.6.38.

Flight Lieutenants.—W. D. Butler, to Experimental Co-operation Unit, Martlesham Heath, 8.6.38. G. F. Overbury, to H.Q., No. 26 (T.) Group, Hendon, 20.6.38. P. Bathurst, to Home Aircraft Depot, Henlow, 1.7.38. E. R. Pearce, to Home Aircraft Depot, Henlow, 1.7.38. E. J. Corbally, to H.Q., No. 12 (F.) Group, Hucknall, 20.6.38. R. N. Clarke, to No. 220 (G.R.) Sqn., Bircham Newton, 27.6.38. D. P. Hanafin, to H.Q., No. 26 (T.) Group, Hendon, 13.6.38. J. E. C. G. F. Gyll-Murray, to H.Q., No. 26 (T.) Group, Hendon, 13.6.38.

Accountant Branch

Flight Lieutenant.—R. F. Fleming, to Home Aircraft Depot, Henlow, 16.6.38.

Medical Branch

Squadron Leader.—F. B. C. L. B. Crawford, to H.Q., Fighter Command, Stanmore; for duty as a Medical Officer, 4.7.38.

Flight Lieutenants.—C. Crowley, to Princess Mary's R.A.F. Hospital, Halton, 1.7.38. V. H. Tompkins, to Central Medical Establishment, London, 1.7.38.

FOREIGN SERVICE NEWS

Norwegian-built Capronis

UNDER the new quota agreement between Norway and Italy, the Norwegian Air Force is to give orders for the supply of two-engined Caproni bombers (presumably Ca.135s) to the value of 1,800,000 kroner (£900,000). The machines will be built under licence in Norway.

American Expansion

THE U.S. War Department announces the placing of an order for an additional thirteen Boeing B-17 B four-engined bombers, bringing the total in service and on order up to 52. Having delivered its initial series of thirteen in 1937, the Boeing Company is now engaged in building the second batch of twenty-six, deliveries of which are scheduled to begin early next year. The entire fleet is expected to be completed early in 1940.

The Brewster Aeronautical Corp. of Long Island City, New York, has been awarded a contract for fifty-four F2 A-1 single-seater Navy fighters powered with Wright Cyclone engines. These machines are mid-wing monoplanes with retractable undercarriage.

The U.S. Army has contracted for twenty-six Grumman amphibian flying-boats with two 450 h.p. Pratt and Whitney Wasp Junior engines. These will be designated model O A-9 and will accommodate a crew of two and four passengers.

The Grumman concern has also been awarded a contract for the supply of twenty-seven F3 F-2 single-seater Navy biplane fighters, similar to the Gulfhawk of Major L. Williams, some illustrations of, and notes on, which appeared in *Flight* of July 7. This is a repeat order for the type of machine; eighty-one were previously ordered, and practically all have been delivered.

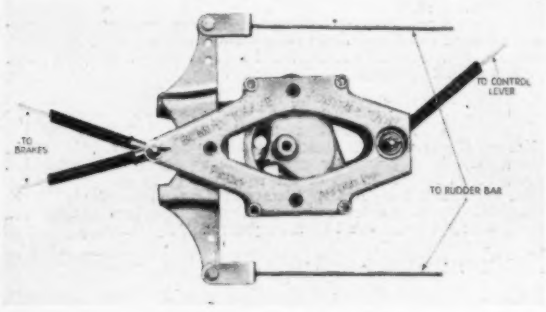
PRODUCTION PURSUIT: The Curtiss P.36 single-seater pursuit machine now in production for the U.S. Army Air Corps. Its Twin Wasp engine has a cowing of elliptical section. The performance is probably rather inferior to that of the Hurricane.

THE INDUSTRY

Differential Braking

SIMPLICITY is the keynote of the latest Bendix differential control unit for cable-operated brakes, illustrated on this page.

The general principle is, of course, well known, consisting as it does of hand-lever operation of the brakes in conjunction with a steering-by-brake system connected with the rudder bar. The Bendix unit avoids the necessity for attaching levers, pulleys, etc., to various points on the machine—methods which in some cases result in untidiness and inefficiency.



The Bendix Differential Unit.

The unit is a compact device, occupying a few cubic inches of space only, and merely requiring to be connected to hand-brake lever, brakes and rudder bar. Its fitting, too, is simple, consisting of four screws or bolts.

Between the top and bottom plates swings a main lever carrying two pulleys, round which pass the brake operating cables, the ends of which are coupled to the false rudder bar, seen on the left. The false rudder bar is connected to the rudder bar in the cockpit, either by two cables or by a single rod. The main lever is connected to the hand-brake control lever.

In order to steer the machine by the brakes the pilot first applies them by the lever to approximately one-third of the maximum amount, and then directs the machine by using the ordinary flight rudder-bar movements. For full brake or parking on the aerodrome, the hand lever is, of course, applied to its maximum extent.

A feature of the control is that the brake cables are connected to the false rudder bar at points so disposed that, when steering on the ground, the increase in braking on the inside wheel is not so great in proportion as the decrease in braking on the outer wheel, thus securing smooth and progressive action.

The unit has been arranged for right- or left-handed operation, and is, in fact, readily adaptable to a variety of different cockpit arrangements. Bendix, Ltd., Tyseley, Birmingham, are the makers.

The Saro Staff

FOLLOWING the article "Nautical Interlude" in *Flight* of July 7, it should be added that Capt. Frank Courtney has been engaged temporarily as a consultant and test pilot, having taken over many flying duties from Flt. Lt. Ash, who remains the firm's chief test pilot.

Incidentally, Mr. Perfect, who is now liason officer with the R.A.F. and Air Ministry, and who is handling publicity, has been with the firm for nine years, two being spent as works manager.

Financial Results

THE full accounts of the Bristol Aeroplane Company show that net profits rose last year from £295,089 to £344,575, an increase of roughly 17 per cent. Of this amount the board is transferring a further £100,000 to general reserve, raising this fund to £1,200,000, equal to the whole of the issued ordinary capital, and the balance forward is slightly higher at £10,755.

A final dividend of 17½ per cent. is declared on the £1,200,000, making 25 per cent. for 1937.

* * *

Short Brothers last week announced an issue of 250,000 redeemable 5 per cent. cumulative preference shares of £1 at par and 50,000 5s. ordinary shares at 27s. 6d. Proceeds will be used to develop the company's business and to replace part of the working capital locked up in the company's holding of ordinary shares in Short and Harland, Ltd.

* * *

Blackburn results for the past year show that, mainly due to the establishment of the Clydeside factory and extensions of the Brough works, issued capital was increased from £630,000 to £800,000, and the fixed assets were nearly doubled—their latest book value is £727,505—while the gross stock and work in progress rose from £548,200 to £1,234,268.

After again placing £25,000 to general reserve, the directors are able to raise the ordinary dividend from 12½ per cent. to 15 per cent.

* * *

Handley Page, Ltd., who distributed to shareholders a substantial scrip bonus last December, now propose a further capitalisation of reserves. In addition to recommending a final ordinary dividend of 20 per cent., tax free, for 1937, which follows an interim of 10 per cent., less tax, paid in October, the board is to make a bonus issue to ordinary stockholders of one unit for every two now held. This is to raise the issued capital to a figure "more in accordance with the actual capital employed in and necessary for the requirements of the expansion programme."

The company's net profit for 1937 was £210,126, as compared with £102,679 in 1936.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

(*Published July* 22, 1938.)

35273. FAIRHURST, L. G.: Variable-pitch airscrews (486,614).
4387. FAIREY AVIATION CO., LTD., ROBERTS, H.F., and VENNING, W. H.: Control apparatus, especially for aircraft (486,682).
5357. BOULTON PAUL AIRCRAFT, LTD., and NORTH, J. D.: Feeding ammunition belts to machine guns (486,684).
10182. FAIREY AVIATION CO., LTD., and LOBELLE, M. J. O.: Mechanism for actuating the wing flaps of aircrait (486,565).
11818. EVEREL FOREIGN CORPORATION: Screw propeller for aircraft or the like (486,566).
15656. FAIREY, C. R.: Controlling devices for aeroplanes (486,568).
17021. DORNIER-WERKE GES., and DORNIER, DR. ING.: Aircraft wings (486,823).
29137. SUKOHL, H.: Method of and apparatus for coating the blades of airscrew propellers (486,646).
29631. SCHWARZ, G., and SCHWARZ, O.: Airscrew propellers (486,838).
32724. LORENZ AKT.-GES. C.: Antenna structures for radio direction-finding systems (486,652).
36014. DOWTY, G. H.: Locking means for retractable undercarriages of aircraft (486,936).
9585. HEFELE, E. J.: Radio direction-finder (486,576).
9607. HUDSON, R. J. H.: Retractable undercarriages for aircraft (486,748).
9608. HUDSON, R. J. H.: Operation of control surfaces of aircraft (486,749).
30659. EVANS, R. C. T.: Illuminating-flares (486,515).
27388. HUDSON, R. J. H.: Design and construction of folding wings or planes for aircraft (486,758).
29805. BRISTOL AEROPLANE CO., LTD., and RADCLIFFE, J. M.: Supercharged internal-combustion engines for aircraft (486,759).
29880. LEE, A.: Aircraft (486,849).
33418. JABLONSKY, B.: Airscrews (486,919).
33426. HAWKER AIRCRAFT, LTD., and BURGOINE, S.F.: Riveting tools and the like (486,920).
33503. HEADEN, L. A.: Apparatus for preventing ice-formation on aircraft surfaces (486,549).
33557. GODFREY & PARTNERS, LTD., SIR G., and THEED, W. D. L.: Braking and/or mooring of aircraft (486,556).
33793. DUNLOP RUBBER CO., LTD., WRIGHT, J., and TREVASKIS, H.: Hydraulic apparatus for operating automatic guns on aircraft (486,773).
33794 and 33795. DUNLOP RUBBER CO., LTD., WRIGHT, J., and TREVASKIS, H.: Hydraulic apparatus for the remote control of automatic guns on aircraft (486,774).
33872. BINKS, C. L. and AMAL, LTD.: Fastening devices for aircraft cowlings and like covers (486,784).
34070. SPERRY GYROSCOPE CO., INC.: Automatic pilots for aircraft (486,788).
34078. COATS, A. G., and HAFNER, R.: Rotary-wing aircraft (486,883).
34171. ECLIPSE AVIATION CORPORATION: Automatic control means for de-icing mechanisms for aircraft (486,891).
34183. GORST, P. E., and CLAPHAM, G.: Air-defence aprons (486,895).
34547. OESTERREICHISCHE AGA-WERKE AKT-GES.: Arrangement for practising firing by means of compressed air from machine guns and other light guns (486,794).
24918. BRETTELL, F. G. (Holmes, R. V.): Automatic steering systems for dirigible craft (487,145).
20776. BLACKBURN AIRCRAFT, LTD. and FENTON, G. B.: Laterally controlling aircraft (486,954).
31126. HUDSON, R. J. H.: Design and construction of folding wings or planes for aircraft (487,049).
34371. WALLER, T.: Exhaust silencer heater for road vehicles and aeroplanes (487,060).
6420. CHANCE BROS. & CO., LTD., and HALLETT, L. B. H.: Wind-direction indicators (487,171).
8157. UNITED AIRCRAFT CORPORATION: Propellers (487,084).
23399. LINK, Jun., E. A.: Means and methods of instrument indication in aeroplanes and the like (487,010).
29097. SHEVLIN, J. T. (Siemens Apparate und Maschinen Ges.): Directional instruments for air or other craft (487,290).
29149. NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE FABRIEK VAN BRONSWERKEN VOORHEEN BECHT & DYSERINCK: Air outlet device, particularly for apparatus for ventilating ships, railway carriages and aircraft cabins (487,023).
31395. TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE: Navigation-aiding radio systems (487,302).